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FOOD TECHNOLOGY ABSTRACTS

Vol. 29 No. 7
July 1994

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FOOD
TECHNOLOGY
ABSTRACTS

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ABBREVIATIONS

A	ampere
AAS	atomic absorption spectrometry
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm^2, cm^3]
cal	calorie
cd	candela
°C	degree centigrade
Ci	curie
CMC	carboxymethyl cellulose
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetraaceti acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10^{-15}, as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram
GC	gas chromatography
gr	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycles/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcalk, kg]
K	Kelvin
l	litre
lb	pound
lbf	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-	equivmilli-equivalent
M	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt.	molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10^{-9}, as in nm]
N	Newton [kg m/s^2]
N.	North, Northern, etc
N	Normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10^{-12}, as in pCi]
P	Poise
p	probability
Pa	pascal (N/M^2)
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride
qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	South, Southern, etc.
s.d.	standard deviation
SDS	sodium dodecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp., spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
W	watt
W.	West, Western, etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
µ	micro-[as in g, µm]
%	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

ABBREVIATIONS FOR LANGUAGES

Language of text	
Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	E
Swedish	Sv

GENERAL

1216

Dick (JJ). **ISO 9000 and HACCP: A definite role in the Indian food industry.** *Indian Food Industry* 12(6); 1993; 16-18

This article deals with Hazard Analysis Critical Control Points (HACCP) and its role within ISO-9000 and is intended to prompt and confirm the value of HACCP and its role within ISO-9000 to companies in the Indian food industry. CSA

1217

Agarwal (SR). **Quality improvements of food products by SSI units.** *Indian Food Industry* 12(6); 1993; 19-22, 25

Quality improvements can basically be achieved through institution of formal meetings, change of old habits/atitudes, sharing of experience, formal training and such other actions. The above tools and techniques of behavioural skills can be applied to any small scale industry for overall improvement of not only quality of manufactured food products but quality of life as well. CSA

1218

Ferris (DA), Shanklin (CW) and Flores (RA). **Solid waste management in food service.** *Food Technology* 48(3); 1994; 110-113, 115

This article presents the current available information on food packaging waste, ascertains the amount and type of waste being generated and reports the results of two recently completed waste stream analyses at Kansas State University. CSA

1219

Raghuramaiah (B). **Flavours for food industry.** *Beverage and Food World* 21(3); 1994; 11-13

1220

O'Donnell (C). **The science of convenience.** *Prepared Foods* 162(1); 1993; 38-40

Development of convenience foods (CFs) in terms of formulation, packaging and structure is described. Aspects covered include: reasons for the need for CFs; popularity of packaged meals for children; areas with potential for growth in sales (convenience poultry, fish and meat products; sous-vide foods; chilled foods; and toaster pastries); CF food outlets; distribution of CFs and its effect on product quality; and food safety trends. BV

1221

Pedi (R) and Moesta (R). **Total quality in product development.** *Prepared Foods* 162(2); 1993; 44-46

Discusses the use of Total Quality Management in food product development. Aspects covered include: defining the scope of research and development (product design, defining objectives, improved communications); levels of quality in product development; Quality Function Deployment; and Taguchi methods. BV

FOOD PROCESSING

1222

Shaw (A), Mathur (P) and Mehortra (NN). **Food processing: A scenario.** *Indian Food Packer* 47(3); 1993; 5-15

The history of food processing industry in India, its scope and status; fruit and vegetable based products; targets and achievements of food processing sector during the plans; number of licensed units and installed capacity; and factors influencing the growth of food processing industry are discussed. GS

1223

Chaudhari (AP), Kumbhar (BK), Singh (BPN) and Narain (M). **Osmotic dehydration of fruits and vegetables - A review.** *Indian Food Industry* 12(1); 1993; 20-27

Reviews the advantages and disadvantages of osmotic dehydration (OD), its application to fruits and vegetables, the process of OD, the factors that effect the rate of moisture removal (variety, pretreatment, osmotic agent, process

temp., agitation/circulation, solution to sample ratio, time of treatment, size and shape of the sample), treatments after OD, mass transfer and the economy in using OD. 42 references. CSA

1224

Anon. **Pasteurization revisited.** *Prepared Foods* 162(2); 1993; 49-50

Two new 'cold' pasteurization techniques available to the food industry, ultra-high pressurization pasteurization (UHPP) and electric impulse poration pasteurization (EIPP), are described. With UHPP, the pressure treatment destroys the cellular integrity of microorganisms without detrimentally affecting heat labile flavour compounds, vitamins and other essential components. Examples of ultra-high pressurization pasteurized foods include: highly spreadable jams with innate fresh flavours; non-bitter grapefruit juice, with debittering incurred via inhibition of limonene production; and rapidly tenderized meats. With EIPP, liquid foods are passed through very narrow orifices across which are passed high voltage electric pulses. The electric pulses inactivate microorganisms by electroporation. BV

1225

Davey (KR). **Extension of the generalized sterilization chart for combined temperature and pH.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 476-479

Describes a generalized procedure for prediction of the exposure time necessary for sterilization of foods, as influenced by combined temp. and pH. The sterilization temp. used were chosen to simulate conditions used in commercial processing (110, 115 and 120°C). The procedure is illustrated using inactivation of *Clostridium botulinum* in a range of foods (spaghetti, tomato sauce and cheese; macaroni creole; and spanish rice). Results demonstrate the necessity of including pH as an environmental factor in the detn. of an appropriate sterilization process. Results also demonstrate that this practical method should provide a convenient tool for assessment of the necessary sterilization designs. BV

FOOD PACKAGING

1226

Katan (L). **The greening of the British packaging industry.** *Indian Food Packer* 47(3); 1993; 63-65

Outlines the environmental problems of food packaging in Britain; proposed directive by the European Commission; the advisory role of Industry Council for Packaging and the Environment; new raw materials developed; modification of products and packages developed. GS

1227

Anon. **Weight control: it's in the bag.** *Prepared Foods* 162(2); 1993; 75-76

Vertical form-fill-seal systems coupled with computer controlled weight delivery systems are described, which can produce filled packs at high speeds while minimizing product waste in the form of underweight rejects. Selection of a delivery system (which depends on the product's physical properties and economics); wt. control of products that are not uniform in size or shape (jelly beans, cut vegetables, shredded cheese, potato chips, frozen chicken legs, fish fillets); system control software (controlling selection of the correct hoppers for net wt.); form-fill-seal equipment; bag styles (pillow pouch, standard fin seal, lap seal); and control of film handling are the aspects covered. BV

1228

Seonggyun (S) and Bhowmik (SR). **Determination of thermophysical properties of plastic cans used for thermal sterilization of foods.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 400-405

Values of the surface heat transfer coeff. for heating and cooling media, thermal diffusivity of the plastic wall and plastic wall-to-food conductance were simultaneously estimated using a numerical model together with a multivariate optimization technique. Model-estimated and experimentally

determined temp. profiles at several locations inside the plastics cans filled with a conduction-heated food simulant were used. Nutrient retention, sterilizing values and processing times for foods processed in cylindrical plastics cans were determined using the estimated thermophysical property values. Influence of the thermophysical properties on temp. response and nutrient retention in the food was also studied. BV

FOOD ENGINEERING AND EQUIPMENT

1229

Ramaswamy (HS), Abbatemarco (C) and Sablani (SS). **Heat transfer rates in a canned food model as influenced by processing in an end-over-end rotary steam/air retort.** *Journal of Food Processing and Preservation* 17(4); 1993; 269-286

Effects of various factors on heat transfer rates of a canned food model (gelatinized starch) were evaluated during thermal processing in an agitating retort. Process variables were retort temp. (110-130°C), rotation speed (10-20 rpm), can headspace (6.4-12.8 mm) and starch concn. (3-4%). Thermal process parameters (heating rate index, f_h, and heating lag factor, j_{ch}) and the resulting process lethality, F_o and cook value, C_o were obtained from time-temp. data obtained during processing for 3 consecutive runs. Rheological properties and colour were experimentally evaluated both before and after each run. Overall heat transfer coeff. (U_o) was calculated from the heating rate index using a lumped capacity approach. The study indicated that f_h, j_{ch}, F_o and C_o were influenced (P less than 0.05) by all process variables except can headspace. U_o was related to retort temp., rotation speed and initial apparent viscosity. The best dimensionless correlation for U_o was Nusselt number (logarithmic scale) vs specific apparent viscosity and Froude number ($R^2 = 0.65$). AA

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

1230

Giese (J). **Modern alchemy: Use of flavours in food.** *Food Technology* 48(2); 1994; 106-108, 110, 112-116

The article provides an overview of the terminology and classification of flavour into various categories (fruit extracts and juice concentrates, natural flavours, spices (essential oils and essences, oleoresins), process flavours, aromatic compounds and artificial flavours); different forms of flavours (solid, semisolid/paste and liquid); storage; labeling of flavours; safety and application of flavour ingredients in specific product areas such as low-fat foods, beverages, dairy products, meat products, mayonnaise and salad dressings. CSA

1231

Mei Chin (Y) and Faustman (C). **Influence of temperature, pH, and phospholipid composition upon the stability of myoglobin and phospholipid: a liposome model.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 853-857

An oxymyoglobin (OxyMb) was used to study effects of temp., pH, phospholipid (PL) polar head group and fatty acid composition on OxyMb and PL oxidation (TBA). Both oxidations were enhanced by increased temp. (37 > 20 > 10 > 4°C) and decreased pH (5.6 > 6.4 > 7.2) ($P < 0.05$). OxyMb and PL oxidation in OxyMb-liposomes prepared from commercial PL followed the order phosphatidylserine (PS) > phosphatidylethanolamine (PE) > phosphatidylcholine (PC) ($P < 0.05$). Since both PL polar head group and fatty acid composition were believed to affect stability of OxyMb and the PL bilayer, PC and PE with defined fatty acids at Sn1 = 16:0 and Sn2 = 18:2 or 20:4 were used to construct OxyMb-liposomes. When fatty acid composition was held constant, PE-based OxyMb-liposomes showed a greater increase in both oxidations than PC-based OxyMb-liposomes ($P < 0.05$). When the PL polar head group was held constant, increased chain

length and unsaturation of fatty acids resulted in greater OxyMb and PL oxidation ($P < 0.05$). The in vitro model provided evidence that OxyMb and PL oxidations are interrelated. AA

1232

Fukamachi (M), Matsui (T), Shimoda (M), Nakashima (M) and Osajima (Y). **Sorption depression of flavors into modified EVA film by lowering film-flavor affinity.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 929-932

Surface hydrolysis of EVA film resulted in specific sorption depression behaviour of volatile compounds. Sorptions of hydrocarbons, ethyl octanoate and decanal into hydrolysed EVA film were depressed; sorption of alcohols was promoted. To elucidate the phenomena, the solubility parameter (SP) concept was introduced. From plots of sorptions against SP values of volatile compounds, for all hydrocarbons, ethyl esters and aldehydes with the cohesive energy of < 19.3 SP, sorptions were depressed; for hexanal and alcohols with SP values of > 19.3 the opposite results were obtained. The depression effect may be attributed to lowering of compatibility at the surface between the hydrolysed film and volatile compounds. Sensory evaluation illustrated that hydrolysed EVA film preserved the flavour of lemon juice. AA

1233

Kubo (I), Muroi (H), Himejima (M), Yamagiwa (Y), Mera (H), Tokushima (K), Ohta (S), Kamikawa (T). **Structure-antibacterial activity relationships of anacardic acids.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 1016-1019

A series of anacardic acids [an antimicrobial agents in cashew nuts] possessing different side-chain lengths was synthesized and antimicrobial activity was tested. Anacardic acid with a C_{10} alkyl side chain was most active against Staphylococcus aureus, while against *Propionibacterium acnes*, *Streptococcus mutans* and *Brevibacterium ammoniagenes*, the anacardic acid possessing the C_{12} alkyl side chain was most effective. AA

1234

Estrada (P), Baroto (W), Castillon (MP), Acebal (C) and Arche (R). **Temperature effects on polyphenol oxidase activity in organic solvents with low water content.** *Journal of Chemical Technology and Biotechnology* 56(1); 1993; 59-65

The effect of temp. on polyphenol oxidase immobilized on glass beads was studied in organic solvents. Optimum temp. for catalysis depended on the solvent and varied from 26°C for dichloromethane to 50°C for toluene, benzene and 1,1,1-trichloroethane. Optimum temp. and activation energy were independent of the water content of the system whereas inactivation energies decreased as the water content of the system was decreased. The enzyme was stable in toluene up to 50°C although residual activity depended on the water content of the system. Thermoinactivation of polyphenol oxidase in toluene gave an activation energy for enzyme decay of 11.5 kcal mol^{-1} which is consistent with a conformational process. Among the agents employed to protect the enzyme against thermal denaturation 1% (w/v) short-chain polyols added to the buffer and 0.5 mmol dm^{-3} *p*-nitrophenol added to toluene more than doubled the half-life of the enzyme. AA

1235

Greener (D-I) and Fennema (O). **The effects of plasticizers on crystallinity, permeability, and mechanical properties of methylcellulose films.** *Journal of Food Processing and Preservation* 17(4); 1993; 247-257

Effects of plasticizers (polyethylene glycols (PEG) 400, 1450, 8000 and 20 000, glycerol (G) and propylene glycol (PG)), 30% dry basis, on the physical properties of methylcellulose (MC) films were investigated. With the exception of PG, plasticizers with low mol. wt. (G and PEG 400) caused the largest increase in the d101 spacing of the crystal lattice. All plasticizers significantly ($\alpha = 0.05$) increased oxygen (O_2P) and water vapour permeabilities (WVP) of the films as compared to that of unplasticized MC, with PEG 400 having the greatest effect on O_2P and G having the greatest effect on WVP. With the exception of PG, all plasticizers decreased the tensile strength of MC films, with PEG 400

causing the largest decrease. With the exception of PG and PEG 400, all plasticizers increased percent elongation values of MC films, with PEG 1450 having the greatest effect. Glycerol and PEG were the most effective plasticizers for MC. The higher mol. wt. plasticizers do provide some plasticizing properties and may be suitable for applications that require a lower permeability to water vapour than can be achieved with glycerol. AA

1236

Greener (D-I) and Fennema (O). **The effects of solution composition and drying temperature on crystallinity, permeability and mechanical properties of methylcellulose films.** *Journal of Food Processing and Preservation* 17(4); 1993; 231-246

Effects of film drying temp. (100°C for 35 min, 80°C for 1 h, 50°C for 1.5 h or room temp. overnight) and ethanol concn. (0, 25, 50 or 75%) in the aqueous film solution on the physical properties of methylcellulose (MC) films were investigated. Increased drying temp. increased crystallinity in all films. MC films prepared from a 75% water-25% ethanol solvent exhibited smaller permeabilities to oxygen and water vapour, greater crystallinity (when the higher drying temp. were used), greater tensile strength, and greater percent elongation than films prepared from other water or water/ethanol solvents. Ethanol, at a 25% concn., may enhance intermolecular hydrogen bonding of MC, while higher concn. of ethanol may have prevented complete hydration of MC. Extensive association of MC by hydrogen bonding and hydrophobic association (which induces crystallization) likely reinforces the film matrix and presumably produces a film with greater resistance to oxygen and water vapour. AA

FOOD MICROBIOLOGY AND HYGIENE

Enzymes

1237

West (SI). **A review of the commercial carbohydrase market.** *Journal of Chemical Technology and Biotechnology* 56(4); 1993; 416-417

This paper was first presented at the International Conference on the Enzymatic Synthesis and Modification of Carbohydrates held on 1-3 July, 1992 in Warwick, UK. An overview of the markets for carbohydrases during the 1980s is given. Information is included on enzyme use in baking, olive oil processing, animal feed manufacture and textiles production. BV

1238

Pifferi (PG), Bonora (V), Spagna (G) and Tramontini (M). **Immobilization of catalase on macromolecular supports activated with acid dyes.** *Process Biochemistry* 28(1); 1993; 29-38

Immobilized catalase (EC 1.11.1.6) has potential applications in food processing (removal of hydrogen peroxide from milk and in the sterilization of liquids). Immobilization of catalase on a range of natural and synthetic macromolecular supports (chitosan, wool, silk, amberlite, nylon 6, polyvinylpyrrolidone) was investigated. The supports were undyed or activated by dying with sulphonic and carboxylic anionic dyes (Cibacron Blue F3G-A and Erythrosin). Immobilization yield and activation yield were considerably influenced by dye activation. The most promising system was nylon 6 activated by dying with Cibacron Blue. The binding capacity of this activated support was 45 000 U/g, with 33% activity. The technique is economical, simple to perform, conforms with GRAS regulations and can easily be used in industrial processes. Half-life of the immobilized enzyme was high at room temp. and pH 3-4, stability was improved compared to the free enzyme. The utility of this system is partly limited by inactivation at higher temp. BV

1239

Sears (PS) and Clark (DS). **Comparison of soluble and immobilized trypsin kinetics: implications for peptide synthesis.** *Biotechnology and Bioengineering* 42(1); 1993; 118-124

Trypsin was immobilized on porous glass in both the presence and absence of acetylated soybean trypsin inhibitor (STI) to determine whether immobilization could alter enzyme activity in favour of aminolysis over hydrolysis. Results indicated that immobilization raised the free energy barriers for both amide and ester hydrolysis and lowered the energy barrier for aminolysis. In practice, these effects should lower the amidase activity and increase the aminolysis-hydrolysis ratio, rendering the immobilized enzyme a more efficient catalyst for peptide synthesis. AA

Microorganisms

1240

Crapisi (A), Lante (A), Pasini (G) and Spettoli (P). **Enhanced microbial cell lysis by the use of lysozyme immobilized on different carriers.** *Process Biochemistry* 28(1); 1993; 17-21

Lysozyme (EC 3.2.1.17) is a food grade additive used in the manufacture of certain dairy products (cheeses) to prevent growth of *Clostridium* spp. Immobilization of the enzyme would simplify its removal during processing and also allow its reuse. Immobilization of lysozyme and changes in its lytic properties were investigated. Lysozyme was adsorbed onto chitosan and silica gel, was attached via ionic binding to cross-linked polystyrene divinylbenzene matrix (Deacidite KMP) and by covalent attachment to non-porous glass beads. Immobilization yields decreased on decreasing the amount of enzyme loaded whereas the activation yields (defined as % ratio of immobilized active enzyme to immobilized enzyme, a measure of lytic activity against *Micrococcus luteus*) increased. Chitosan, silica gel, Deacidite KMP and non-porous glass beads showed activation yields of 10, 13.2, 26.67 and 12.77%, respectively. Results indicate that the lysozyme immobilized on all carriers retained satisfactory lytic activity and that thisthis technology might be exploited in the dairy industry to prevent the growth of clostridia in milk, thus overcoming the late-blowing of cheese. BV

Bacteria

1241

Ken (Y-L) and Torres (JA). **Effects of temperature and solute on the minimum water activity for growth and temperature characteristic of selected mesophiles and psychrotrophs.** *Journal of Food Processing and Preservation* 17(4); 1993; 305-318

The temp. effect on the temp. characteristic (energy of activation) and the min. a_w for growth of the psychrotrophs *Pseudomonas fluorescens* and *Brochothrix thermosphacta* and the mesophiles *Salmonella typhimurium*, *Streptococcus faecalis* and *Staphylococcus aureus* was analysed in liquid media. Data showed that the min. a_w of mesophiles is higher than that of psychrotrophs and more sensitive to temp. changes. Min. growth a_w was affected by the a_w-controlling solute. The temp. characteristic of psychrotrophs was significantly lower than that of mesophiles suggesting a strong synergistic effect of low temp. and reduced a_w on the growth of mesophiles. Effect of a_w on the temp. characteristic depended on the a_w-controlling solute. AA

1242

Ferreira (JL), Baumstark (BR), Hamdy (MK) and McCay (SG). **Polymerase chain reaction for detection of type A *Clostridum botulinum* in foods.** *Journal of Food Protection* 56(1); 1993; 18-20

A DNA fragment of type A *Clostridium botulinum* neurotoxin gene was demonstrated in canned food products with polymerase chain reaction (PCR). The fragment, 1340-bp in size, was amplified from green peas, whole kernel corn, green beans, lima beans, black-eyed peas and turnip greens previously inoculated with type A *C. botulinum*. The PCR products were identified by agarose gel electrophoresis and also confirmed by dot blot DNA hybridization with a type A specific gene probe. Some inoculated foods were PCR negative but became PCR positive after subculture and overnight incubation in brain heart infusion broth. No PCR amplification products were obtained from uninoculated foods. The procedure was highly sensitive and detected as few as 100 vegetative cells/ml brain heart infusion broth culture. AA

1243

Ibrahim (SA) and Bezkorovainy (A). **Survival of bifidobacteria in the presence of bile salt.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 351-354

The ability of *Bifidobacterium* spp. to survive in the presence of sodium glycocholate, at concn. ranging from 0 to 3 g l^{-1}, was tested. Bacterial growth was monitored by measuring the optical density for up to 48 h. All the *Bifidobacterium* strains tested showed growth limitation in the presence of sodium glycocholate. However, after a series of propagations in fresh trypticase-peptone-yeast extract medium devoid of bile salt all bacterial strains retained their activity. Results indicated that *Bifidobacterium* spp. are able to survive physiological and higher bile salt levels and that bifidobacteria can be considered for use as dietary adjuncts. BV

1244

Ford (JB), Askins (KJ) and Taylor (KB). **Kinetic models for synthesis by a thermophilic alcohol dehydrogenase.** *Biotechnology and Bioengineering* 42(3); 1993; 367-375

Bacillus amyloliquefaciens

1245

Castro (GR), Mendez (BS) and Sineriz (F). **Amylolytic enzymes produced by *Bacillus amyloliquefaciens* MIR-41 in batch and continuous culture.** *Journal of Chemical Technology and Biotechnology* 56(3); 1993; 289-294

Bacillus amyloliquefaciens MIR-41 was isolated and characterized. The strain showed 3 types of glucanase activities: α-amylase, α-glucosidase and pullulanase (in defined medium with starch as C source). Extracellular activity of α-amylase was approx. 3x higher in continuous culture than in batch. Max. productivity occurred at a dilution rate of 0.16 h^{-1}. α-Glucosidase was expressed as a cell-bound enzyme in batch culture, but in continuous culture was mostly extracellular. Pullulanase was always cell-bound. Expression of the enzyme was dependent upon the system and the dilution rate used. No cell lysis was detected in the chemostat as compared with batch cultures. AA

Bacillus subtilis

1246

Klein (C), Kaletta (C) and Entian (KD). **Biosynthesis of the lantibiotic subtilin is regulated by a histidine kinase/response regulator system.** *Applied and Environmental Microbiology* 59(1); 1993; 296-303

Subtilin is a lanthionine-containing peptide antibiotic (lantibiotic) which is produced by *Bacillus subtilis* ATCC 6633. Upstream from the structural gene of subtilin, spaS, 3 genes (spaB, spaT and spaC) which are involved in the biosynthesis of subtilin have been identified. By using a hybridization probe specific for these genes, the DNA region downstream from spaS was isolated. Further subcloning revealed a 5.2-kb KpnI-HindIII fragment on which 2 open reading frames (ORF), spaR and spaK, were identified approx. 3 kb downstream from spaS. The spaR gene encodes an ORF of 220 amino acids with a predicted molecular mass of 25.6 kDa. SpaR shows 35% similarity to positive regulatory factors OmpR and PhoB. The spaK gene encodes an ORF of 387 amino acids with a predicted molecular mass of 44.6 kDa and was highly similar to histidine kinases previously described (PhoM, PhoR and NtrB). Hydrophobicity blots suggested 2 membrane-spanning regions. Thus, spaR and spaK belong to a recently identified family of environmentally responsible regulators. Results indicated a regulatory function of spaR and spaK in subtilin biosynthesis. Batch culture experiments confirmed the regulation of subtilin biosynthesis starting in the mid-logarithmic growth phase and reaching its maximum in the early stationary growth phase. Gene deletions within spaR and spaK yielded subtilin-negative mutants, which confirmed that subtilin biosynthesis is under the control of a 2-component regulatory stytem. A fusion of the spaR ORF with the constitutively expressed spo promoter was used to complement the spaR mutant to exclude any polar effects of spaR on spaK. AA

Clostridium sporogenes

1247

Shamsuzzaman (K) and Lucht (L). **Resistance of *Clostridium sporogenes* spores to radiation and heat in various nonaqueous suspension media.** *Journal of Food Protection* 56(1); 1993; 10-12

The influence of suspension in a phosphate buffer and various lipid media on heat and radiation resistance of *Clostridium sporogenes* PA3679 was examined. Lyophilized spores were suspended in vegetable oils, animal fats, synthetic triglycerides, glycerol or phosphate buffer, and their radiation and heat D_{10} values (dose or time required for 90% inactivation) were determined. Radiation D_{10} values in the lipids were much higher than in phosphate buffer. Radiation D_{10} values in triolein and tributyrin were similiar, suggesting chain length may not be a significant factor in radiation resistance. The heat D_{10} value of the spores in a phosphate buffer at 95 plus or minus 1°C was close to that in beef fat and was much higher than in other lipid media tested. Heat D_{10} value in triolein was > twice that in tributyrin, suggesting fatty acid chain length is an important factor in heat resistance of the spores in triglycerides. The effects of various nonaqueous suspension media on radiation-induced thermosensitivity of spores were also determined. A comparison of heat D_{10} values of spores with and without prior irradiation in various media showed that irradiation at 5.0 kGy greatly increased their heat sensitivity. AA

Corynebacterium glutamicum

1248

Broeer (S), Eggeling (L) and Kraemer (R). **Strains of *Corynebacterium glutamicum* with different lysine productivities may have different lysine excretion systems.** *Applied and Environmental Microbiology* 59(1); 1993; 316-321

The lysine excretion systems of 3 different lysine-producing strains of *Corynebacterium glutamicum* were characterized in intact cells. 2 strains (DG 52-5 and MH 20-22B) are lysine producers of different efficiency. They were bred by classical mutagenesis and have a feedback-resistant aspartate kinase. The third strain (KK 25) was constructed from the wild type by introducing the feedback-resistant aspartate kinase gene of strain MH 20-22B into its genome. The 3 strains were shown to possess different excretion systems. Export in strain KK 25 is much slower than in the 2 mutants. Differences between the 2 lysine-producing strains are more stable. K_m V_{max} are similar, but pH dependence and membrane potential dependence reveal differences in the intrinsic properties of the carrier system. AA

Lactobacillus acidophilus

1249

King (VAE) and Su (JT). **Dehydration of *Lactobacillus acidophilus*.** *Process Biochemistry* 28(1); 1993; 47-52

Freeze-drying (FD), vacuum-drying (VD) and controlled low-temp. vacuum dehydration were used to dehydrate *Lactobacillus acidophilus*. FD gave the highest survival ratio, followed by low-temp. vacuum dehydration. The latter process required shorter drying times but produced products with case hardening and shrinkage and poor rehydration rates. The VD treatment was considered to be unsuitable for culture preservation use. Addition of various protectants did not improve storage of dehydrated products. Storage at low temp. (5 and -20°C) was better than room temp. storage. BV

Lactobacillus bulgaricus

1250

Venkatesh (KV), Okos (MR) and Wankat (PC). **Kinetic model of growth and lactic acid production from lactose by *Lactobacillus bulgaricus*.** *Process Biochemistry* 28(4); 1993; 231-241

Batch and continuous fermentation kinetics of *Lactobacillus bulgaricus* were examined. The batch kinetic model included the effect of pH, product (lactic acid) and substrate (lactose). The effect of pH on the enzyme β-galactosidase was reflected in the value of μmax. Monod's growth constant. Empirical expressions to

estimate model parameters based on pH were established. These were used to estimate cell mass and lactic acid concn. for fermentations without pH control. At high pH, lactic acid was mostly formed by growth associated mechanisms and at low pH it was due to cell maintenance. The relationship between ATP concn. and cell mass in a batch fermentation could be approximated by a Leudeking-Piret like relationship. Continuous fermentations were studied by varying pH and initial substrate conditions. Max. productivity of 6.2 g/l per h was obtained at pH 5.6 for the CSTR (continuous stirred tank reactor) system, which was 3x the productivity obtained for a batch system at the same pH. The CSTR system had a high productivity over a very small range of retention times. 3 stages were sufficient to completely utilize the lactose, but at the cost of decreasing productivity to 4.8 g/l per h. AA

Lactobacillus plantarum

1251

Vujcic (M) and Topisirovic (L). **Molecular analysis of the rolling-circle replicating plasmid pA1 of *Lactobacillus plantarum* A112.** *Applied and Environmental Microbiology* 59(1); 1993; 274-280

Lactobacillus plantarum A112 has 4 different plasmids. Plus-origin-specific probes were used to determine that the smallest, cryptic plasmid, pA1 (2820 bp), showed homology to the pE194 plasmid family. This subclass of plasmids uses the rolling-circle mode of replication. Analysis of plasmid pA1 demonstrated that it generates single-stranded DNA intermediates, and sequence analysis revealed that it contains 3 putative open reading frames (ORF): ORF1, ORF2 and ORF3, which could encode proteins designated RepA (47 amino acids [aa]) and RepB (196 aa) and a protein of 103 aa, respectively. 2 of these proteins, RepA (5.6 kDa) and RepB (26 kDa), were identified in *in vitro* transcription translation assays. The RepA protein contained a characteristic α-helix-turn-α-helix motif typical of DNA-binding proteins that act as DNA-binding repressors. The RepB protein showed a significant similarity with replication initiation proteins of the pE194 family of plasmids that use the rolling-circle mode of replication. Plasmid pA1 was able to replicate in *Escherichia coli* and *Lact. lactis* subsp. *lactis* as well as in other *Lact. plantarum* strains. AA

Lactococcus lactis

1252

de Vos (WM), Mulders (JWM), Siezen (RJ), Hugenholtz (J) and Kuipers (OP). **Properties of nisin Z and distribution of its gene, nisZ, in *Lactococcus lactis*.** *Applied and Environmental Microbiology* 59(1); 1993; 213-218

Two natural variants of the lantibiotic nisin that are produced by *Lact. lactis* are known. They have a similar structure but differ in a single amino acid residue at position 27: histidine in nisin A and asparagine in nisin Z. The 2 variants were purified to apparent homogeneity, and their biological activities compared. Identical MIC [min. inhibitory concn.] of nisin A and nisin Z were found with all tested indicator strains of 6 different spp. of Gram-positive bacteria. However, at concn. above the MIC, with nisin Z the inhibition zones obtained in agar diffusion assays were invariably larger than those obtained with nisin A. This was observed with all tested indicator strains. Results suggest that nisin Z has better diffusion properties than nisin A in agar. The distribution of the nisin variants in various lactococcal strains was determined by amplification of the nisin structural gene by PCR followed by direct sequencing of the amplification product. It was established that the nisZ gene for nisin Z production is widely distributed, having been found in 14 of the 26 *Lact. lactis* strains analysed. AA

1253

Moineau (S), Durmaz (E), Pandian (S) and Klaenhammer (TR). **Differentiation of two abortive mechanisms by using monoclonal antibodies directed toward lactococcal bacteriophage capsid proteins.** *Applied and Environmental Microbiology* 59(1); 1993; 208-212

Monoclonal antibodies were used to monitor accumulation of the major capsid protein of the lactococcal small isometric bacteriophage u136 (P335 species) over the course of a one-step growth curve [of *Lactococcus lactis*]. A sandwich

ELISA was then used to distinguish 2 abortive phage resistance mechanisms, Hsp and Prf. Capsid protein production of u136 was almost totally inhibited by the Hsp-induced abortive mechanism, supporting previous data that this mechanism blocks phage DNA replication. Prf-induced abortive infection only partially (50%) inhibited capsid protein production, suggesting that this mechanism targets some other point, perhaps within transcription or translation processes. Results confirmed that Hsp and Prf act at different targets in the phage lytic cycle. Use of the monoclonal antibodies also demonstrated that the production of the major capsid protein is a nonlimiting step in the lytic cycle of lactococcal phage u136. AA

1254

Israelsen (H) and Hansen (EB). **Insertion of transposon Tn917 derivatives into the *Lactococcus lactis* subsp. *lactis* chromosome.** *Applied and Environmental Microbiology* 59(1); 1993; 21-26

Two transposition vectors, pTV32 and pLTV1, containing transposon Tn917 derivatives TV32 and LTV1, respectively, were introduced into *Lactococcus lactis* subsp. *lactis* MG1614. pTV32 and pLTV1 replicated and TV32 and LTV1 transposed in this strain. A protocol for production of a collection of Tn917 insertions in *Lact. lactis* subsp. *lactis* was developed. Physical locations of TV32 on the chromosomal SmaI fragments of 62 independent transpositions were established by pulsed-field gel electrophoresis. These transpositions could be divided into at least 38 different groups that exhibited no Tn917-dominating hot spots on the *Lact. lactis* subsp. *lactis* chromosome. 10 of the 62 transpositions resulted in strains that expressed β-galactosidase. This indicates that there was fusion of the promoterless lacZ of the Tn917 derivatives to a chromosomal promoter. Thus, the Tn917-derived transposons should be powerful genetic tools for studying *Lact. lactis* subsp. *lactis*. AA

1255

Hyndman (CL), Groboillot (AF), Poncelet (D), Champagne (CP) and Neufeld (RJ). **Microencapsulation of *Lactococcus lactis* within cross-linked gelatin membranes.** *Journal of Chemical Technology and Biotechnology* 56(3); 1993; 259-263

Lactococcus lactis subsp. *cremoris* were encapsulated within gelatin membranes cross-linked with toluene-2,4-diisocyanate at an oil/water interface. Reagent toxicity was avoided by use of vegetable or silicone oil as a dispersant, and by minimizing cell exposure to the water insoluble cross-linking agent during membrane formulation. Growth of cells within the gelatin microcapsules was observed during fermentation and acidification activity of the encapsulated cells increased with subsequent reuse. A microencapsulated cell density of 10^9 cfu cm^{-3} resulted in acidification of milk to pH 5.5 within 2.8 h, similar to that achieved in free cell fermentations. AA

Listeria

1256

Czajka (J), Bsat (N), Piani (M), Russ (W), Sultana (K), Wiedmann (M), Whitaker (R), Batt (CA). **Differentiation of *Listeria monocytogenes* and *Listeria innocua* by 16S rRNA genes and intraspecies discrimination of *Listeria monocytogenes* strains by random amplified polymorphic DNA poly.morphisms.** *Applied and Environmental Microbiology* 59(1); 1993; 304-308

Differences in the 16S rRNA genes (16S rDNA) which can be used to discriminate *Listeria monocytogenes* from *L. innocua* were detected. The 16S rDNA were amplified by PCR with a set of oligonucleotide primers which flank a 1.5-kb fragment. Sequence differences were observed in the V2 region of 16S rDNA both between *L. monocytogenes* Scott A and *L. innocua* and between different *L. monocytogenes* serotypes. Although *L. monocytogenes* SLCC2371 had the same V2 region sequence as *L. innocua*, the 2 spp. were different within the V9 region at nucleotides 1259 and 1292. Intraspecies discrimination of *L. monocytogenes* strains was achieved by using the patterns generated by random amplified polymorphic DNA primers. Although some distinction can be made within the *L. monocytogenes* sp. by their 16S rDNA sequence, a far greater discrimination within sp. could be made by generating random amplified polymorphic DNA patterns from chromosomal DNA. By using a number of 10-bp primers, unique patterns for each isolate which in all cases examined differentiate

between various *L. monocytogenes* serotypes, even though they may have the same 16S rRNA sequences, could be generated. AA

Listeria monocytogenes

1257

Datta (AR), Moore (MA), Wentz (BA) and Lane (J). **Identification of enumeration of *Listeria monocytogenes* by nonradioactive DNA probe colony hybridization.** *Applied and Environmental Microbiology* 59(1); 1993; 144-149

A plasmid containing the cloned listeriolysin gene of *Listeria monocytogenes* was used as a gene probe to identify *Listeria* strains by DNA colony hybridization. The probe DNA was labelled with horseradish peroxidase in the presence of glutaraldehyde. After hybridization and wash procedures, hybrid molecules were detected by luminescence, which resulted from oxidation of luminol by a horseradish peroxidase-hydrogen peroxide-coupled reaction. Of 150 Listeria strains and 16 non-Listeria strains examined, the probe hybridized only with L. monocytogenes. The technique was used to enumerate L. monocytogenes in artificially contaminated foods [cheese, lettuce, shrimp]. AA

1258

Hefnawy (YA) and Marth (EH). **Survival and growth of *Listeria monocytogenes* in broth supplemented with sodium chloride and held at 4 and 13 degree.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 388-392

Pseudomonas fluorescens

1259

Rodriguez (F-C), Berasategui (J) and Villafafila (A). **Role of bivalent cations on the catalytic properties of an extracellular lipase of *Pseudomonas fluorescens*.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 422-425

An extracellular lipase (EC 3.1.1.3) from *Pseudomonas fluorescens* was investigated and its kinetic constants with 4-methylumbelliferyl oleate was determined. Effects of Ca^{2+}, Mg^{2+} and Hg^{2+} ions and EDTA on lipolytic activity were also determined. Ca^{2+} and Mg^{2+} ions were found to be activators of lipase activity; activation constants of 1.14×10^{-4} and 5.83×10^{-5} mol/l, respectively, were derived. Hg^{2+} inhibited the extracellular lipase activity; an inactivation constant of 1.98×10^{-7} mol/l was determined. BV

Streptococcus thermophilus

1260

Shahbal (S), Hemme (D) and Renault (P). **Characterization of a cell envelope-associated proteinase activity from *Streptococcus thermophilus* H-strains.** *Applied and Environmental Microbiology* 59(1); 1993; 177-182

Production and biochemical properties of cell envelope-associated proteinases from 2 strains of *Streptococcus thermophilus* (CNRZ 385 and CNRZ 703) were compared. No significant difference in proteinase activity was found for strain CNRZ 385 when cells were grown in skim milk medium and M17 broth. Strain CNRZ 703 exhibited a 3-fold-higher proteinase activity when cells were grown in low-heat skim milk medium than when grown in M17 broth. 41% of total activity of CNRZ 385 was localized on the cell wall. Optimum pH for enzymic activity at 37°C was approx. 7.0. Serine proteinase inhibitors, such as phenylmethylsulphonyl fluoride and diisopropylfuorophosphate, inhibited enzyme activity in both strains. The divalent cations Ca^{2+}, Mg^{2+}, and Mn^{2+} were activators, while Zn^{-2+} and Cu^{2+} were inhibitors. β-Casein was hydrolysed more rapidly than α_{s1}-casein. Results of DNA hybridization and immunoblot studies suggested that the *Strep. thermophilus* cell wall proteinase not closely related. AA

Fungi

1261

Rane (KD) and Hoover (DG). **An evaluation of alkali and acid treatments for chitosan extraction from fungi.** *Process Biochemistry* 28(2); 1993; 115-118

Chitosan extractions of mycelia from *Absidia coerulea* ATCC 14076 were examined using hot alkaline and acid treatments. Alkaline treatments were carried out at 95 and 121°C using sodium hydroxide with varying extraction times. Acid treatments were carried out at 95°C using hydrochloric, formic and acetic acids with various extraction times. The highest yields of chitosan were obtained with alkaline extraction at 121°C for 30 min and hydrochloric acid extraction at 95°C for 12 h. Effects on the degree of acetylation and viscosity of the chitosan of various treatments were also examined. AA

1262

Paul (GC), Kent (CA) and Thomas (CR). **Viability testing and characterization of germination of fungal spores by automatic image analysis.** *Biotechnology and Bioengineering* 42(1); 1993; 11-23

1263

Thompson (DP), Metevia (L) and Vessel (T). **Influence of pH alone and in combination with phenolic antioxidants on growth and germination of mycotoxigenic species of *Fusarium* and *Penicillium*.** *Journal of Food Protection* 56(2); 1993; 134-138

The effect of pH alone and in combination with 2 phenolic antioxidants on mycelial growth and conidial germination of mycotoxigenic fungi was examined. Mycotoxigenic fungi studied included 7 members each of *Fusarium* and *Penicillium* genera. The study was carried out at pH 4, 6, 8 and 10 alone and in the presence of 100 and 200 µg/ml BHA and propyl paraben, respectively. All test fungi examined were able to grow at pH 4, 6, 8 and 10 on potato dextrose agar. The majority of *Fusarium* spp., except *F. graminearum*, were tolerant of acid and alkaline pH. 2 of the *Penicillium* spp. were rapid growers and were tolerant of acid and alkaline pH. Slower growing *Penicillium* spp. varied in their tolerance to acid and alkaline pH. Conidial germination was partially inhibited in all *Fusarium* and *Penicillium* spp. in the presence of 100 µg/ml BHA at all pH levels. In the presence of 200 µg/ml BHA, there was complete inhibition of conidial germination for 4 of the *Fusarium* spp. at all pH levels. Propyl paraben, at the 4 pH levels completely inhibited conidial germination in *Fusarium* spp. and all but one *Penicillium* spp. at 200 µg/ml. Reduction in colony diam. for the majority of *Fusarium* and *Penicillium* spp., at all pH levels was observed at 100 and 200 µg/ml BHA. At 200 µg/ml propyl paraben, mycelial growth was completely inhibited for the majority of *Fusarium* and *Penicillium* spp. at the 4 pH levels. AA

Aspergillus flavus

1264

Payne (GA), Nystrom (GJ), Bhatnagar (D), Cleveland (TE) and Woloshuk (CP). **Cloning of the afl-2 gene involved in aflatoxin biosynthesis from *Aspergillus flavus*.** *Applied and Environmental Microbiology* 59(1); 1993; 156-162

Aflatoxins are extremely potent carcinogens produced by *Asp. flavus* and *Asp. parasiticus*. Cloning of genes in the aflatoxin pathway provides a specific approach to understanding regulation of aflatoxin biosynthesis and, subsequently, to control the aflatoxin contamination of food and feed. Isolation is described of a gene involved in aflatoxin biosynthesis by complementation of an aflatoxin nonproducing mutant with a wild-type genomic cosmid library of *Asp. flavus*. Strain 650-33, blocked in aflatoxin biosynthesis at the afl-2 allele, was complemented by a 32-kb cosmid clone (B9), resulting in production of aflatoxin. The onset and profile of aflatoxin accumulation was similar for the transformed strain and the wild-type strain (NRRL 3357) of the fungus, indicating that the integrated gene was under the same control as in wild-type strains. Complementation analyses with DNA fragments from B9 indicated that the gene resides within a 2.2-kb fragment. Because this gene complements the mutated afl-2 allele, it was designated afl-2. Genetic evidence obtained from a double mutant showed that afl-2 is involved in aflatoxin biosynthesis before the formation of norsolorinic acid, the first stable intermediate identified in the pathway. Metabolite feeding studies with mutant, transformed, and wild-type cultures and enzymic activity measurements in cell extracts of these cultures suggested that afl-2 regulates gene expression or the activity of other aflatoxin pathway enzymes. This is the first reported

isolation of a gene for aflatoxin biosynthesis in *Asp. flavus*. AA

1265

Lekha (PK), Ramakrishna (M) and Lonsane (BK). **Strategies for the isolation of potent fungal cultures capable of producing tannin acyl hydrolase in higher titres.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 5-10

Production of tannase (tannin acyl hydrolase) by 10 fungi isolated directly from soil and by 33 strains from culture collections was studied. Max. production in solid state fermentation was poor (< 400 units/g dry mould bran) and a renewed isolation programme using various isolation sources and strategies was undertaken. 76 fungal isolates were obtained; the 3 highest producers of tannase were obtained by a baiting method (involving incubation of moist soil with 1% tannic acid for 10 days and subsequent enrichment in liquid medium containing 2% tannic acid as sole C source) and were able to produce 980-1100 units/g dry mould bran. The next highest tannase producer was obtained from moist myrobalan nut powder. *Aspergillus niger* PKL 104, the highest producer of tannase obtained by the baiting method, required tannic acid as inducer to produce the enzyme. Biosynthesis of the enzyme increased with the increase in tannic acid concn. up to 4% (w/w) while the enzyme was not produced in the absence of the inducer. Tannic acid was rapidly consumed by the culture and enzyme production was found to be growth associated. AA

Aspergillus niger

1266

Sandhya Xavier, Ramakrishna (M), Lonsane (BK), Karanth (NG) and Krishnaiah (MM). **Suppression of transglucosidase coproduction by moisture content of the medium in amyloglucosidase production by *Aspergillus niger* in solid state fermentation.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 25-29

Transglucosidase was not coproduced by *Asp. niger* CFTRI 1105 in wheat bran media with less than 80% initial moisture content in a solid state fermentation system for production of amyloglucosidase. It was coproduced in media with 80-98% initial moisture content and also in 3 different submerged fermentation media under both static and agitated conditions. Coproduction of transglucosidase increased by 3.3 times when initial moisture content was increased from 80 to 90%. Suppression of transglucosidase coproduction by moisture content of the medium is being reported for the first time and is of economical and practical significance. AA

1267

Srinivas (MRS), Sriram (P) and Lonsane (BK). **Growth kinetics, α-galactosidase biosynthesis, and concomitant production of invertase by *Aspergillus niger* NCIM 839 in solid state fermentation system.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 41-46

Production of α-galactosidase by *Aspergillus niger* NCIM 839 increased by 32.62% with the inclusion of 4% guar flour and 1% lactose in the basal wheat bran medium. Incorporation of guar flour, lactose or glucose did not improve enzyme titres and enrichment with ammonium sulphate resulted in irregular trends. Invertase was also concomitantly produced with alpha-galactosidase. Production of both enzymes appeared to be mostly cell growth associated as only 19.5% of total α-galactosidase was formed in the early stationary phase. Temp. and pH optima of acetone-precipitated α-galactosidase were 60°C and 4.5, respectively and were independent of each other. The enzyme exhibited max. stability between pH 5.2 and 6.2, but was found to be heat labile. Properties of α-galactosidase produced by *Asp. niger* NCIM 839 appear to be suited for application in soy processing, but not in the beet sugar industry due to the coproduction of invertase. AA

Mucor miehei

1268

Oliveira (AC) and Cabral (JMS). **Kinetics studies of *Mucor miehei* lipase in phosphatidylcholine microemulsions.**

Journal of Chemical Technology and Biotechnology 56(3); 1993; 247-252

Ethanol-oleic acid esterification by a free and microencapsulated lipase from Mucor miehei, using dodecane as solvent and phosphatidylcholine as surfactant, was studied. The initial esterification rate was influenced by the water content in the biphasic system. Kinetic studies with free and microencapsulated enzyme showed that microencapsulation increased kinetic parameters (V_{max} and K_m), probably due to an increased interfacial area. The reaction rate was also affected by the shaking rate, temp. and pH. Optimal temp. and pH were, respectively, 40°C and 4.5 using free enzyme, and 50°C and 6 using microencapsulated enzyme. AA

Mucor rouxii

1269

Kafetzopoulos (D), Martinou (A), Tsigos (I) and Bouriotis (V). **Isolation and characterisation of chitin deacetylase from *Mucor rouxii*.** *Journal of Chemical Technology and Biotechnology* 56(4); 1993; 417-418

This paper was presented at the International Conference on the Enzymatic Synthesis and Modification of Carbohydrates held on 1-3 July, 1992 in Warwick, UK. Chitin deacetylase from *M. rouxii* was purified and characterized. The apparent mol. wt. of the enzyme was 75 000 by SDS-PAGE and gel filtration. The enzyme was an acidic high mannose glycoprotein with pH and temp. optima of 4.5 and 50°C, respectively. An immunoaffinity purification technique for the enzyme is described. BV

Mushrooms

1270

Nussinovitch (A) and Kampf (N). **Shelf-life extension and conserved texture of alginate-coated mushrooms (*Agaricus bisporus*).** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 469-475

Mushrooms were coated with different concn. of alginate film (1 or 2%); the coating process involved chemically crosslinking the alginate with Ca. After coating, mushrooms were stored at room temp. or 4°C. 1% coated mushrooms stored at room temp. and 1 and 2% coated cold stored mushrooms were found to have higher L (lightness-darkness) values, indicating a lighter colour and a better appearance than untreated controls. The rate of evaporation for coated mushrooms decreased on storage at room temp., thereby preventing changes in texture. Coated mushroom strength, as tested using a Universal Tesing Machine, and integrity were maintained for greater periods than those for uncoated controls. Appearance of coated mushrooms was also improved by the glossiness of the coating. BV

1271

Madenjian (JJ), Eifert (JD) and Lawrence (JF). **Ciidae: newly recognized beetle pests of commercial dried mushrooms.** *Journal of Stored Products Research* 29(1); 1993; 45-48

One hundred and sixty-seven samples representing 8 species of packaged, dried mushrooms were collected from 29 markets in the central Los Angeles area. Packages were visually examined for obvious insect infestations. Ciid material, representing 3 species, was found in 6 samples. 1 of these samples which had been stored for about 8 months after collection from the market yielded large numbers of live ciid adults and larvae from the one package. This finding represents direct evidence of post-harvest development and thereby establishes stored product pest status for the family. No previous literature exists on ciids as pests of commercial, stored, dried mushrooms. AA

Neosartorya fischeri

1272

Hang (YD) and Woodams (EE). **Characterization of glucoamylase from *Neosartorya fischeri*.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 483-484

The heat resistant fungi *Neosartorya fischeri* M-1 produced large amounts of thermostable

extracellular glucoamylase after 96 h of growth in a corn starch medium. The enzyme was most active at 55-60°C, pH 4.0-4.4. K_m V_{max} values for the enzyme using 1% amylopectin as substrate were 2.4 g/l and 12 mg glucose/(l/min), respectively. Mol. wt. of the enzyme was estimated by gel filtration to be approx. 34 kDa. BV

Yeasts

1273

Gupta (PK), Garg (SK) and Mital (BK). **Incidence of yeasts from different sources.** *Beverage and Food World* 21(3); 1994; 20, 21, 23

Morphological and biochemical study was conducted to determine the incidence of different types of yeast sp. encountered in flowers, lemon, apple, curd and bread. 15 yeast cultures were isolated and identified as *Trichosporon eriense*, *T. melibiosaceum*, *Candida versatilis*, *C. intermedia*, *C. maltosa*, *C. buirensis*, *C. silvicultrix*, *C. oleophila* and *Rhodotorula fujisensis*. *Candida* sp. were the most frequently isolated yeasts as compared to the sp. of *Trichosporon* and *Rhodotorula*. SRA

1274

Ming-Pan (T) and Chi-Ku (CO). **Production of flavor by a mutant of yeast.** *Journal of Food Processing and Preservation* 17(3); 1993; 213-225

Strain CCU-N_{16}-18143 was derived from a wild strain CCU-16 after treatment with N-methyl-N'-nitro-N-nitrosoguanidine (NTG) 3x. This mutant was identified as *Saccharomyces* sp. Optimal culture medium for production of flavour compounds was 1 l of medium containing 100 g glucose, 12 g ammonium nitrate, 3 g yeast extract, 1 g magnesium sulphate, 1 g ammonium sulphate, 2 g potassium dihydrogen phosphate, pH 3.5. Optimal culture conditions were: temp. 30°C; agitation 150 rpm of 50 ml medium in 500-ml Hinton flask; incubation time 96 h. The volatile flavour compounds in the culture medium were analysed by capillary GC and capillary GC-MS. It was found that more volatile compounds were produced by the mutant strain than the wild strain. The content of isoamyl alcohol in the medium increased from 7.76 to 61.64%, whereas ethyl alcohol decreased from 85.25 to 5.77%. AA

Saccharomyces cerevisiae

1275

Giuseppin (MLF), Almkerk (JW), Heistek (JC) and Verrips (CT). **Comparative study on the production of guar α-galactosidase by *Saccharomyces cerevisiae* SU50B and *Hansenula polymorpha* 8/2 in continuous cultures.** *Applied and Environmental Microbiology* 59(1); 1993; 52-59

Saccharomyces cerevisiae SU50B and *Hansenula polymorpha* 8/2, both carrying a recombinant multicopy integrated guar α-galactosidase gene, were cultivated in continuous cultures, using various mixtures of C sources and cultivation conditions. Both *Sacch. cerevisiae* SU50B and *H. polymorpha* 8/2 were stable and produced high levels of extracellular α-galactosidase in continuous cultures for greater than 500 h. For expression, the strong inducible promoter systems GAL7 and methanol oxidase, respectively, were used. Induction of α-galactosidase synthesis by galactose in SU50B was limited by low galactose uptake. At high dilution rates, glucose repression was substantial, and a max. expression level of 28.6 mg of extracellular α-galactosidase g biomass^{-1} (dry weight) was obtained. In *H. polymorpha*, induction of α-galactosidase synthesis, in addition to methanol oxidase synthesis using formaldehyde, was very effective up to 42 mg of extracellular α-galactosidase g biomass^{-1} (dry wt.). Productivities of *S. cerevisiae* SU50B and *H. polymorpha*, 3.25 and 5.5 mg of α-galactosidase g biomass^{-1} l^{-1} h^{-1}, respectively, rank among the highest reported in the literature. Enzyme production and secretion in *H. polymorpha* was more complex. A 2-peaked optimum in enzyme production occurred. No clear explanation of this phenomenon can be given. AA

1276

Longo (E) and Vezinhet (F). **Chromosomal rearrangements during vegetative growth of a wild strain of *Saccharomyces cerevisiae*.**

Applied and Environmental Microbiology 59(1); 1993; 322-326

Electrophoretic karyotypes of 2 strains of *Sacch. cerevisiae*, a haploid laboratory strain and a wild strain known to be at least diploid, were checked during vegetative growth. The karyotype of the haploid strain was very stable; however, the diploid strain underwent frequent modifications. In most cases the number of bands was reduced, but occasionally 1 band splitting into 2 was observed. In 1 case, chromosomal rearrangements took place between differently sized copies of chromosomes I and VI. It was concluded that the chromosome length polymorphism observed among wild strains of *Sacch. cerevisiae* could be explained partly by chromosomal structure reorganization occurring during mitosis. AA

1277

Stanley (GA) and Pamment (NB). **Transport and intracellular accumulation of acetaldehyde in *Saccharomyces cerevisiae*.** *Biotechnology and Bioengineering* 42(1); 1993; 24-29

BIOTECHNOLOGY

1278

Gowthaman (MK), Ghildyal (NP), Raghava Rao (KSMS) and Karanth (NG). **Interaction of transport resistances with biochemical reaction in packed bed solid state fermenters: the effect of gaseous concentration gradients.** *Journal of Chemical Technology and Biotechnology* 56(3); 1993; 233-239

Mass transfer plays an important role in solid state fermentation (SSF) systems. Earlier work on SSF in tray bioreactors indicated that steep gaseous concentration gradients developed within the substrate bed, owing to mass transfer resistances, which may adversely affect bioreactor performance. These gradients were effectively eliminated using a packed bed column bioreactor with forced aeration. Gaseous concn. (O_2 and CO_2) and enzyme [amyloglucosidase] activities were measured at various bed heights for various air flow rates during the course of [*Aspergillus niger*] fermentation. Results indicated that concn. gradients were decreased effectively by increasing air flow rate. For example, the actual O_2 and CO_2 concn. gradient reduced from 0.07 and 0.023% (v/v) cm^{-1} to 0.007 and 0.0032% (v/v) cm^{-1}, respectively, when air flow rate was increased from 5 to 25 dm^3 min^{-1}. This resulted in an overall improvement in performance of the bioreactor in terms of enzyme production. AA

1279

Wiseman (A). **Designer enzyme and cell applications in industry and in environmental monitoring.** *Journal of Chemical Technology and Biotechnology* 56(1); 1993; 3-13

The application of enzymes in biotechnology is reviewed. Aspects considered include: industrial uses of enzymes and cells; enzymes in the detergents industry; enzymes in the brewing industry; enzymes in other food industries, including the sugar industries; environmental monitoring using immobilized enzymes and cells; environmental aromatic chemicals and their detection; and concluding comments. 49 references. BV

1280

Ajongwen (NJ) and Barker (PE). **Scale-up studies of non-aerated fed-batch fermentation of dextransucrase and the industrial synthesis of dextran using the enzymatic route.** *Journal of Chemical Technology and Biotechnology* 56(1); 1993; 113-118

High activities of dextransucrase [EC 2.4.1.5] were produced using slowly agitated non-aerated fed-batch fermentation of *Leuconostoc mesenteroides* B-512(F). Activities greater than 24.0 U cm^{-3} were obtained in a 16 dm^3 laboratory fermenter using a 6 dm^3 initial work vol. Yeast extract type was an important influencing factor on enzyme yield. The presence of CO_2 in the medium favoured high enzyme production. Agitation rates did not have significant effects on either cell growth or enzyme production. Silicone antifoam affected enzyme production but not cell growth. Scale-up to 1000 dm^3 resulted in enzyme broths containing up to 21.0 U cm^{-3} being

produced. 2 batches of the large scale produced enzyme were used to synthesize dextran at a 50 000 dm^3 industrial scale. Dextran yields were up to 95.5% of conventional industrial yields and were achieved in much shorter reaction time intervals. AA

1281

Demirici (A), Pometto (ALIII) and Johnson (KE). **Lactic acid production in a mixed-culture biofilm reactor.** *Applied and Environmental Microbiology* 59(1); 1993; 203-207

Novel solid supports, consisting of polypropylene (pp) blended with various agricultural materials (pp composite), were evaluated as supports for pure- and mixed-culture continuous lactic acid fermentations in biofilm reactors. *Streptomyces viridosporus* T7A (ATCC 39115) was used to form a biofilm, and *Lactobacillus casei* subsp. *rhamnosus* (ATCC 11443) was used for lactic acid production. For mixed-culture fermentations, a 15-day continuous fermentation of *Strep. viridosporus* was performed initially to establish the biofilm. The culture medium was then inoculated with *L. casei* subsp. *rhamnosus*. For pure-culture fermentation, *L. casei* subsp. rhamnosus was inoculated directly into the reactors containing sterile pp composite chips. The biofilm reactors containing various pp composite chips were compared with a biofilm reactor containing pure polypropylene chips and with a reactor containing a suspension culture. Continuous fermentation was started, and each flow rate (0.06-1.92 ml/min) was held constant for 24 h; steady state was achieved after 10 h. Lactic acid production was determined throughout the 24 h period by HPLC. Production rates 2-5x faster than those of the suspension culture (control) were observed for the pure- and mixed-culture bioreactors. Both lactic acid production rates and lactic acid concn. in the culture medium were consistently higher in mixed-culture than in pure-culture fermentations. Biofilm formation on chips was detected at harvest by chip clumping and Gram staining. AA

1282

Chartier (CMP), Nardi (M), Chopin (MC), Chopin (A) and Gripon (JC). **Cloning and sequencing of pepC, a cysteine aminopeptidase gene from *Lactococcus lactis* subsp. *cremoris* AM2.** *Applied and Environmental Microbiology* 59(1); 1993; 330-333

A gene coding for an aminopeptidase (PepC) from *Lactococcus lactis* subsp. *cremoris* AM2 was cloned by complementation of an Escherichia coli mutant lacking aminopeptidase activity. The nucleotide sequence was determined. A portion of the predicted amino acid sequence of PepC (436 amino acids) showed strong homology to the active site of cysteine proteases. No signal sequence was found, indicating an intracellular location of the enzyme. AA

1283

Stamatis (H), Xenakis (A), Provelegiou (M) and Kolisis (FN). **Esterification reactions catalyzed by lipases in microemulsions: the role of enzyme localization in relation to its selectivity.** *Biotechnology and Bioengineering* 42(1); 1993; 103-110

Activity of lipases from Rhizopus delemar, R. arrhizus and Penicillium simplicissimum entrapped in microemulsions formulated by bis-(2-ethylhexyl)sulphosuccinate sodium salt (AOT) in isooctane was studied in esterification reactions of various aliphatic alcohols with fatty acids. The effect of the nature of the fatty acids (chain length) and of the alcohols (primary, secondary, tertiary; chain length; cyclic structures) on lipase activities was investigated in relation to the reverse micellar structure. Lipases showed a selectivity regarding the structure of substrates used when immobilized in AOT/isooctane microemulsion system. P. simplicissimum lipase showed higher reaction rates for the esterification of long chain alcohols and secondary alcohols. Primary alcohols had a low reaction rate and tertiary a very slow rate of esterification. Long chain fatty acids were more effectively catalysed than the shorter ones. R. delemar and *R. arrhizus* lipases showed a preference for short chain primary alcohols, while secondary alcohols had a low rate of esterification and tertiary alcohols could not be converted. Medium chain length fatty acids were more efficiently catalysed than long ones. The observed lipase selectivity was related to the localization of the enzyme molecule within the micellar microstructure due to the

hydrophobic/hydrophilic character of the protein. Reverse micellar structural characteristics and the localization of the enzyme were examined by fluorescence quenching measurements and spectroscopic studies. AA

1284

Kurokawa (Y), Sano (T), Ohta (H) and Nakagawa (Y). **Immobilization of enzyme onto cellulose-titanium oxide composite fiber.** *Biotechnology and Bioengineering* 42(3); 1993; 394-397

Fibres of a cellulose-TiO_2 composite were prepared by the reaction of cellulose with titanium iso-propoxide. Enzymes were immobilized on the fibres easily and simply under mild conditions. The fibres were stable in common solvents, high ionic solutions, and over the range of pH values 3-10. AA

1285

Martin (A), Borja (R) and Chica (A). **Kinetic study of an anaerobic fluidized bed system used for the purification of fermented olive mill wastewater.** *Journal of Chemical Technology and Biotechnology* 56 (2); 1993; 155-162

Anaerobic microbial digestion of olive oil mill wastewater (OMW) in a fluidized bed, pretreated by aerobic fermentation with *Geotrichum candidum*, was studied. The bioreactor used (vol. = 3.5 dm^3; biomass concn. = 11.5 g volatile suspended solids dm^3) maintained satisfactory operation for 4-35 days, in terms of hydraulic retention time, and removed 92% of initial chemical oxygen demand. The system was used to develop and test a kinetic model which was subsequently employed to determine growth yield and maintenance coeff. From the results obtained, the Michaelis-Menten equation accurately described substrate uptake (i.e. chemical oxygen demand) in the anaerobic fluidized bed system. Pretreatment of OMW increased the rate of substrate uptake by a factor of 3.2 when compared to untreated OMW. AA

1286

Xu (J) and Taylor (KB). **Characterization of ethanol production from xylose and xylitol by a cell-free *Pachysolen tannophilus* system.** *Applied and Environmental Microbiology* 59(1); 1993; 231-235

Whole cells and a cell extract of *Pachysolen tannophilus* converted xylose to xylitol, ethanol, and CO_2. The whole-cell system converted xylitol slowly to CO_2 and little ethanol was produced, whereas the cell-free system converted xylitol quantitatively to ethanol (1.64 mol of ethanol per mol of xylitol) and CO_2. The supernatant solution from high-speed centrifugation (100 00 x gn) of the extract converted xylose to ethanol, but did not metabolize xylitol unless a membrane fraction and oxygen were also present. Fractionation of crude cell extract by gel filtration resulted in an inactive fraction in which ethanol production from xylitol was fully restored by the addition of NAD^+ and ADP. The continued conversion of xylose to xylitol in the presence of fluorocitrate, which inhibited aconitase, demonstrated that the tricarboxylic acid cycle was not the source of the electrons for the production of xylitol from xylose. Therefore, the source of the electrons is indirectly identified as an oxidative pentose-hexose cycle. AA

1287

Heng (MH) and Glatz (CE). **Charged fusions for selective recovery of β-galactosidase from cell extract using hollow fiber ion-exchange membrane adsorption.** *Biotechnology and Bioengineering* 42(3); 1993; 333-338

Use of charged fusions for selective recovery of β-galactosidase from cell extracts was investigated using a low-cost, easily scaled-up, fast, charge-based separation technique - ion exchange on hollow fibre ion-exchange membranes (HFIEM). The additional charges carried by a series of anionic fusion tails allowed selective binding and release of recombinant β-galactosidase from *Escherichia coli* cell extracts using the HFIEM cartridge. The purification factors increased with fusion length. The β-galactosidase was recovered in active form. For the longest fusion studied, more than 6-fold enrichment in specific activity was attained. Specific activity of the recovered fraction was comparable with that of commercial wild-type β-galactosidase and affinity-purified fusion proteins. AA

1288

Compagno (C), Tura (A), Ranzi (BM) and Martegani (E). **Bioconversion of lactose/whey to fructose diphosphate with recombinant *Saccharomyces cerevisiae* cells.** *Biotechnology and Bioengineering* 42(3); 1993; 398-400

Genetically engineered *Saccharomyces cerevisiae* strains that expressed *Escherichia coli* β-galactosidase genes were able to bioconvert lactose or whey into fructose-1,6-diphosphate (FDP). High FDP yields from whey were obtained at an appropriate ratio of cell concn. and inorganic phosphate. Results indicate that whey as a suitable C source for *Sacch. cerevisiae* growth and as the substrate for fructose diphosphate fermentations. BV

1289

Mosmuller (EWJ), Franssen (MCR) and Engbersen (JFJ). **Lipase activity in vesicular systems: characterization of *Candida cylindracea* lipase and its activity in polymerizable dialkylammonium surfactant vesicles.** *Biotechnology and Bioengineering* 42(2); 1993; 196-204

1290

Zhengjun (W) and Silva (NAda). **Improved protein synthesis and secretion through medium enrichment in a stable recombinant yeast strain.** *Biotechnology and Bioengineering* 42(1); 1993; 95-102

1291

Sebastiao (MJ), Cabral (JMS) and Aires (B-MR). **Synthesis of fatty acid esters by a recombinant cutinase in reversed micelles.** *Biotechnology and Bioengineering* 42(3); 1993; 326-332

Fusarium solani pisi recombinant cutinase, solubilized in bis(2-ethylhexyl) sodium sulphosuccinate (AOT)/isooctane-reversed micelles, was used to catalyse the esterification of fatty acids (FAs) with aliphatic alcohols. pH, W_o (water/surfactant molar ratio), temp. and substrate concn. were optimized. Max. specific activity was obtained for hexanol. The cutinase showed selectivity for short-chain FAs. The stability of the microencapsulated cutinase was investigated at various concn. of water and different pH values. Oleic acid had a negative effect on cutinase stability, while hexanol was a strong stabilizer increasing the half-life of the enzyme approx. 45-times. BV

1292

Wittrup (KD), Weber (AL) and Tsai (P). **Microencapsulation selection for isolation of yeast mutants with increased secretion of *Aspergillus awamori* glucoamylase.** *Biotechnology and Bioengineering* 42(3); 1993; 351-356

A cell microencapsulation selection method is described which allows rapid and quantitative screening of > 10^6 yeast cells for enhanced secretion of *Aspergillus awamori* glucoamylase. The method provides a 400-fold single-pass enrichment for high-secreting mutants and may be adapted for application to growth-based selection schemes with other microorganisms and enzymes. BV

TISSUE CULTURE

Nil

FOOD ADDITIVES

1293

Madhusweta Das and Mukherjee (RK). **Biosurfactants: Promising substitutes for synthetic surface-active agents used as food additives.** *Indian Food Industry* 12(2); 1993; 22-26

The nature and functionality of food surfactants in different food items, chemical synthesis of food surfactants from oils and fats of plant and animal origins, the new alternative approach to chemical synthesis of food surfactants by the use of microorganisms known as biosurfactant, nature and applicability of biosurfactants and the economic and legal aspects involved are discussed in this article. CSA

1294

Tiefel (P) and Berger (RG). **Seasonal variation of the concentrations of maltol and maltol glucoside in leaves of *Cercidiphyllum japonicum*.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 59-61

Antimicrobial agents

1295

Matthews (PD) and Haas (GJ). **Antimicrobial activity of some edible plants: lotus (*Nelumbo nucifera*), coffee, and others.** *Journal of Food Protection* 56(1); 1993; 66-68

A number of edible plant species was investigated for antifungal agents. Whole sprouts and extracts of plant organs were tested in several assays, including bioautography. Amaranth, coffee (*Coffea arabica*), rice, coleus, violet, chervil and lotus (*Nelumbo nucifera*) showed antifungal activity. Rhizomes of lotus had potent antifungal activity against *Aspergillus niger*, *Trichoderma viride* and *Penicillium* spp. Further work is required for characterization of this antifungal agent. BV

Coatings

1296

Anon. **Food gums stick it out in dry mix glazes.** *Prepared Foods* 162(1); 1993; 53

A common problem with glaze toppings is that they are unable to adhere to foods during cooking. Thermal gelation causes the gums to gel when heated and then to return to their original viscosity when cooled. MethocelRegistered food gums from Dow Chemical Co., USA, are described that overcome the problem. When used with instant starches, they exhibit a synergistic increase in liquid viscosity. Thermal gelation converts the viscous sauce to a gelled glaze during cooking to reduce run-off. Glaze adhesion is also improved by the surface active properties of these gums; their colloidal properties cause them to cling readily to the food surface. MethocelRegistered gums create light, no calorie glazes that are maintained throughout freezing, thawing and cooking; they also have moisture control properties. The cellulose-derived gums can create glaze systems that range from thin coatings and sauces to dry mixes. The different gum product types and forms are described. AA

Stabilizers

Gums

1297

Amarjeet Kaur, Minhas (KS) and Sidhu (JS). **Natural and synthetic gums: Properties and uses in food industry.** *Indian Food Industry* 12(2); 1993; 27-32

Properties and uses of gums in viscosity building effects, stabilization of emulsions, suspension of particulates, control of crystallization, inhibition of syneresis, encapsulation, and formation of films and the classification of gums into natural gums, modified natural gums and purely synthetic gums are described in this article: (1) natural gums include: sea weed gums (agar, algin and alginates, carrageenan, furcellaran); plant exudates (gum arabic, gum tragacanth, gum karaya, gum ghatti, larch gum); plant seed gums (guar gum, locust bean gum, psyllium gum, quince gum, tamarind gum, okra gum, pineapple gum); cereal gums/starches; plant extracts; fermentation gums (xanthan gum, scleroglucan, pullulan, dextran, curdlan); animal derived gums (gelatin). (2) modified natural gums include: cellulose derivatives (methyl cellulose or hydroxy propyl/methyl cellulose, hydroxyl ethyl cellulose, microcrystalline celluose/sodium carboxy methyl cellulose); other derivatives (modified, oxidised and cross-linked starches, methoxyl pectin). (3) synthetic gums include: polyvinly pyrrolidone, carboxy vinyl polymers, methyl vinyl ether/maleic anhydrate polymers, ethylene oxide polymers. CSA

CEREALS

1298

Haridas Rao (P) and Venkateshwar Reddy (K). **Specific flours: Production and quality control.** *Indian Miller* 24(1); 1993; 109-114

Some of the practical methods to produce specific flours and their quality control such as selection of suitable wheats: blending of wheat, flour streams and flour; air classification of flour; flour treatment; and quality control (moisture, colour, total ash, acid insoluble ash, gluten content, gluten quality, diastatic activity, damaged starch dough characteristics) are detailed. SRA

1299

Jain (RK) and Srivastav (PP). **Low-cost traditional and improved devices for roasting and puffing of grains.** *Indian Food Industry* 12(2); 1993; 33-37

This article describes the conditioning of grains which involves pre-treatment with moisture, roasting, de-hulling and grinding of grains; traditional and improved devices for puffing and roasting of grains; decription, techniques and special features of the grain puffing machines. Tables showing the performance and the economy of using the grain puffing machine is presented. CSA

Oats

1300

Johansson (ML), Molin (G), Jeppsson (B), Nobaek (S), Ahrne (S), Bengmark (S). **Administration of different *Lactobacillus* strains in fermented oatmeal soup: *in vivo* colonization of human intestinal mucosa and effect on the indigenous flora.** *Applied and Environmental Microbiology* 59(1); 1993; 15-20

Rice

1301

Locatelli (DP) and Daolio (E). **Effectiveness of carbon dioxide under reduced pressure against some insects infesting packaged rice.** *Journal of Stored Products Research* 29(1); 1993; 81-87

A study on the combination of low pressure, increased temp. and CO_2 exposure for effectively disinfesting rice in gas permeate packaging was carried out. Tests were carried out on *Rhyzopertha dominica* (F), *Sitophilus oryzae* (L.), *Oryzaephilus surinamensis* (L.) and *Plodia interpunctella* (Hbn), in a vacuum autoclave 34.6-44.00 kPa operating at 20, 25, 30, 35 or 40°C with CO_2 exposure times of 6, 12, 18, 24, 30, 36, 48 or 54 h. Survival of any stage of development of these spp. could be prevented by treatment for 54 h at 20°C, 30 h at 25°C, 24 h at 30°C, 18 h at 35°C, or 12 h at 40°C. Adults proved particularly susceptible, and a 24-h exposure at 20°C, or 6 h at > 30°C, achieved 100% mortality. Eggs of *R. dominica* and mature larvae and pupae of *P. interpunctella* were particularly tolerant at 20°C, and 54 and 48 h of exposure were required, respectively, to prevent their survival. BV

Wheat

1302

Sekhon (KS), Nagi (HPS) and Singh (N). **Effect of field sprouting of wheat on bread and chapati making properties.** *Indian Miller* 24(1); 1993; 15-20

Wheat crop in Punjab State, India was severely damaged by the extensive rains. Various rain damaged wheat samples were conditioned with water to have 14 and 16% moisture and rested for 24 h for complete permiation of moisture and milled. Suitability of flour tested for chapathi making. All the samples developed discoloration and turned black during subsequent storage. The increased respiration of wet grains during germination and storage decreased the grain wt. Flour from these grains were poor in quality with lower gluten, water absorption and falling number, resulting dough handling problem due to stickiness. Chapathis prepared from this flour was acceptable but their colour was dark. The rain affected samples, being free of aflatoxins had higher load of fungi as compared to normal wheat. SRA

MILLETS

Corn

1303

Taylor (SL), King (JW), Richard (JL) and Greer (JI). **Analytical-scale supercritical fluid**

extraction of aflatoxin B_1 from field-inoculated corn. *Journal of Agricultural and Food Chemistry* 41(6); 1993; 910-913

Analytical-scale supercritical fluid extraction (SFE) was used to remove aflatoxin B_1 from field-inoculated corn samples. Various pressures (2000-15 000 psig), temp. (40-80°C), quantity of supercritical carbon dioxide (SC-CO_2, 50-500 ml of liquid CO_2) and organic modifiers were used to optimize extraction. Addition of an organic modifier to the SC-CO_2 was found to be essential to achieve high aflatoxin B_1 recoveries. Modifier additions of 5-20% by vol. of an acetonitrile/methanol (2:1) mixture or isopropyl alcohol were tested. Analysis of extracts was performed with HPLC coupled with fluorescence detection of the trifluoroacetic acid derivative. Recoveries were maximized by increasing the CO_2 pressure to 5000 psig and organic modifier level to 10-15% (v/v). The SFE method yielded greater than 90% analyte recovery when compared to conventional solvent extraction procedures. Attempts to remove coextracted lipid matter by a supercritical fluid-based cleanup method are also described. The precision of the method is affected by size and homogeneity of corn samples. AA

1304

Kumar (S), Sinha (RK) and Prasad (T). **Propionic acid as a preservative of maize grains in traditional storage in India.** *Journal of Stored Products Research* 29(1); 1993; 89-93

Maize cv. Diara composite was treated with graded concn. (1-5 ml/kg) of propionic acid (PA) to evaluate its effectiveness as a grain preservative in Indian traditional storage structures (kothi (an indoor earthen cylindrical container); bukhari (an outdoor thatched cylindrical container); and gunny bags). A concn. of 2 ml/kg was effective in inhibiting growth of fungi for 12 months in grains stored under gunny bags. For kothi and bukhari the effective concn. was 3 ml/kg. Germinability and nutritional components of the grains were maintained at these concn. After 12 months of storage, germination was 77, 75 and 74% for gunny bags, bukhari and kothi samples, respectively. Protein, sugar, reducing sugars and starch losses were slight in treated samples during 12 months of storage. Difference in efficacy of PA treatment in relation to storage structure was negligible. BV

1305

Clarke (B). **A powdered chemical mixer for bagged grain.** *Journal of Stored Products Research* 29(1); 1993; 15-17

A machine is described for mixing powdered insecticide with maize stored in bags, which avoids the problem of tipping the grain on to the ground. A 100 kg bag can be fully treated in under 5 min compared to at least 15 min using other available methods. The machine based on the cone and drum principle can be easily constructed in a developing country for the equivalent of about 150 sterling. AA

1306

Choudhary (AK) and Sinha (KK). **Competition between a toxigenic *Aspergillus flavus* strain and other fungi on stored maize kernels.** *Journal of Stored Products Research* 29(1); 1993; 75-80

Samples of Diara composite var. of maize were collected at harvest and stored for 52 wk. The incidence of *Aspergillus flavus* in relation to competing fungi (including *Penicillium*, *Alternaria*, *Fusarium* and other *Aspergillus* spp.) on individual maize kernels was observed periodically. Temp., RH and substrate moisture were found to influence competition with *Asp. flavus*. Toxigenic isolates of *Asp. flavus* had the highest incidence during the monsoon season (63%), followed by winter (52%). Aflatoxin B1 production by a toxigenic isolate of *A. flavus* (BUML-608) on maize was inhibited (14-100%) in a competitive environment. Accumulation of aflatoxin B1 in stored maize was highest during the monsoon (1360 µg/kg). A decline (33%) in the level of aflatoxin B1 was observed during the winter. AA

Pearl millets

1307

Seitz (LM), Wright (RL), Waniska (RD) and Rooney (LW). **Contribution of 2-acetyl-1-pyrroline to odors from wetted ground pearl millet.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 955-958

The odourous compound 2-acetyl-1-pyrroline (2AP) caused an undesirable 'mousy' odour in raw pearl millet (PM) grits when wetted and dried slowly. The 2AP in PM was identified by comparing GC retention times, odour at the GC sniffing port, mass spectra and vapour-phase IR spectra with those of 2AP from Jasmine and Indian basmati aromatic rices. Identification of 2AP in aromatic rices had been reported previously. The odour of 2AP at the sniffing port was similar to the undesirable odour in bulk samples of wetted PM grits and was the key factor in identifying 2AP as the aroma component. Both blue and yellow raw PM grits produced 2AP and the mousy odour. BV

PULSES

1308

Guenes (B) and Bayindirli (A). **Peroxidase and lipoxygenase inactivation during blanching of green beans, green peas and carrots.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 406-410

The present study reports the effects of water- and microwave blanching methods on activities of peroxidases and lipoxygenases, and ascorbic acid retention in green beans, peas and carrots. Lipoxygenases and peroxidases were used to indicate the adequacy of blanching treatments. Inactivation kinetics of the enzyme were also estimated. A first order kinetic model was assumed to analyse thermal inactivation of the enzyme systems which consist of heat labile and heat resistant fractions. The average loss of ascorbic acid after water blanching at 96°C was approx. 90% for peas, 72% for carrots and 98% for green beans, with retention of 10% of peroxidase activity. Ascorbic acid loss was 15 and 25% for peas and green beans, respectively, when a lipoxygenase activity of 10% remained. Lipoxygenase activity in carrots was not detected during the experiments. With microwave blanching, loss of ascorbic acid was 53, 34 and 72% for peas, green beans and carrots, respectively, when 90% reduction in peroxidase activity wasachieved. Ascorbic acid loss was 36% for peas and 15% for beans when the remaining lipoxygenase activity was 10%. It is concluded that in water- or microwave blanching in which lipoxygenase is the indicator enzyme, the retention of ascorbic acid is higher compared to when peroxidase is the indicator. The less severe heat treatment required to inactivate lipoxygenases should result in improved product flavour, colour, texture and nutritional values of the vegetables. BV

Blackgram

1309

Ahmad (SK). **Mycoflora changes and aflatoxin production in stored blackgram seeds.** *Journal of Stored Products Research* 29(1); 1993; 33-36

Fungal populations and aflatoxin production were investigated in black gram (*Vigna mungo*) stored for 1 yr in gunny bags or airtight metal bins. At harvest, seeds contained a combination of field and storage fungi (*Alternaria*, *Cladosporium*, *Fusarium* and *Curvularia* spp.). These moulds gradually disappeared in storage, though *Alternaria* and *Fusarium* survived for a comparatively long period. Seed infection by *Aspergillus flavus* and *Penicillium citrinum* was observed during harvesting. Their density increased considerably in storage along with *Asp. terreus*, *Asp. niger*, *Asp. ochraceus*, *Rhizopus stolonifer* and *Chaetomium* spp. Almost 70% of *Asp. flavus* isolates were found to be toxigenic. Aflatoxin contamination was not detected until after 3-4 months of storage and depended on the storage system: closed metal bins restricted air exchange, so reducing oxygen thus causing lower production of aflatoxins. Greater amount of aflatoxins were detected in samples stored in gunny bags; highest amounts (108.4 µg/kg) occurred in gunny bag samples in the wet season. BV

Chickpeas

1310

Singh (KB), Bejiga (G) and Malhotra (RS). **Genotype-environment interactions for protein content in chickpea.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 87-90

Cowpeas

1311

Aluko (RE) and Yada (RY). **Relationship of hydrophobicity and solubility with some functional properties of cowpea (*Vigna unguiculata*) protein isolate.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 331-335

The relationship of hydrophobicity and solubility with some functional properties of cowpea protein isolate was determined. Cowpea protein isolate was prepared by alkali extraction followed by precipitation at pH 4.5. The precipitated proteins were then neutralized to pH 7. Heating of the protein isolate to 100°C for 10 min followed by cooling to room temp. resulted in a significant (P less than or equal to 0.05) decrease in aromatic hydrophobicity (ARH) when compared to the native protein isolate. Inclusion of SDS during heating gave a significant ($P < 0.05$) 1.7-fold increase while inclusion of mercaptoethanol (ME) gave a significant (P less than or equal to 0.05) 2.5-fold increase in ARH of the cooled protein solution. Protein solubility (PS), foam expansion (FE) and emulsification activity index (EAI) of the isolate generally increased significantly (P less than or equal to 0.05) upon heating or treatment with urea or SDS or a combination of SDS and ME. Backward stepwise multiple regression was used to obtain equaltions for predicting emulsifying and foaming properties of the protein isolate from solubility and hydrophobicity parameters. PS, ARH and aliphatic hydrophobicity (ALH) were important in predicting foam stability and emulsion stability, while PS and ALH were important for predicting FE. ALH alone was important for predicting EAI. AA

1312

Piergiovanni (AR), Gatta (C-della) and Perrino (P). **Effects of storage conditions on the trypsin inhibitor content in flour and whole seeds of cowpea (*Vigna unguiculata*).** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 426-429

Portions of cowpea seeds and meal were stored in a desiccator at either -20, 4 or 40°C; samples were also stored at 40°C and 95% RH in beakers placed in closed glass jars containing a small amount of water. Storage at 4 or 40°C reduced antitryptic activity by 20-30%. At 40°C, 95% RH, the max. rate of trypsin inhibitor activity disappearance was found. When the samples were stored at -20°C, the initial levels of inhibitors remained unchanged for up to 130 days. Milling of the cowpeas to meal before storage did not prevent or improve loss of antitryptic activity. BV

Lentils

1313

Bernabe (M), Fenwick (R), Frias (J), Jimenez Barbero (J), Price (K), Valverde (S), Vidal Valverde (C). **Determination, by NMR spectroscopy, of the structure of ciceritol, a pseudotrisaccharide isolated from lentils.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 870-872

An unknown pseudotrisaccharide was isolated from *Lens culinaris* seeds. NMR spectroscopy of the substance established unambiguously its structure as α-D- galactopyranosyl-(16)- α-D-galactopyranosyl- (12)-4-O- methyl-*chiro*-inositol. This compound received the trivial name of ciceritol. It was previously identified as manninotriose. AA

Lupins

1314

Muzquiz (M), Ridout (CL), Price (KR) and Fenwick (GR). **The saponin content and composition of sweet and bitter lupin seed.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 47-52

Seeds of 6 sp. of lupin (*Lupinus albus* (sweet and bitter), *L. angustifolius* (sweet and bitter), *L. luteus* (sweet and bitter), *L. hispanicus*, *L. consentinii* (lagao/faro) and *L. mutabilis*) were analysed for total saponin content and sapogenol composition. The saponin content ranged from 0 to 470 mg kg^{-1} with none being detected in *L. albus*; 56.7 and 68.3 mg kg^{-1} in *L. luteus* (sweet and bitter, respectively); 107.9 mg kg^{-1} in *L. mutabilis*; 302.7 mg kg^{-1} in *L. hispanicus*; 216.1 mg kg^{-1} in the *L. consentinii*; and 270.1 and 469.5 mg kg^{-1} in *L. angustifolius* (sweet and bitter, respectively). 3 saponins were

detected, 1 containing soyasapogenol B and considered to be identical to soyasaponin 1, the other 2 being bisdesmosides of soyasapogenol A. Ratio of the 2 sapogenols in the overall saponin mixture varied between 0.3:1 and 3.1:1. AA

Peas

1315

Daveby (YD), Abrahamsson (M) and Aman (P). **Changes in chemical composition during development of three different types of peas.** *Journal of the Science of Food and Agriculture* 63 (1); 1993; 21-28

Three Swedish pea (*Pisum sativum* L.) cv., Timo (dark-coloured seed), Vreta (light-coloured seed) and Capella (light-coloured seed and leafless), were harvested at different stages of seed maturity and dehulled by hand. Changes in chemical composition during growth and maturation were analysed in dehulled seeds and dietary fibre components in the hulls (seed coats). Generally, Capella had the largest seeds, lowest hull content, highest yield and lowest losses due to pod opening. Timo had the highest hull content. Concn. of sucrose and glucose + fructose was high in the young dehulled seeds and decreased rapidly until the starch concn. reached its max. early during development. Thereafter, the starch concn. decreased somewhat while the concn. of crude protein and oligosaccharides belonging to the raffinose series increased. Glutamic acid (the predominant amino acid in dehulled seeds), arginine, alanine, threonine and methionine had the highest concn. in the very young dehulled seeds but decreased rapidly. Concn. of the other amino acids, including cyst(e)ine and lysine, was low in the young seeds and thereafter increased. Concn. of dietary fibre and major dietary fibre components in dehulled seeds generally increased during growth and maturation. Dietary fibre concn. in hulls also increased dramatically during growth and maturation. The light-coloured hulls contained more non-starch polysaccharides, including glucose, uronic acid and xylose residues as major components, but lower concn. of Klason lignin compared to the dark coloured hulls. AA

OILSEEDS AND NUTS

1316

Mondhe (OPS) and Rao (JT). **Studies on non-conventional oilseeds: Search for new sources of edible and industrial oils.** *Journal of the Indian Chemical Society* 70(1); 1993; 53-55

Ougeinia dalbergioids Benth. seeds of forest origin were investigated for their fatty oil constituents and some applications of the oil to edible as well as industrial purposes like alkyed resins and other oil-derived products. Oil was prepared incorporating azoalkyed disperse dyes by step by step process of polymerisation, co-polymerisation, diazotisation and coupling with phenolic compounds. Prepared dyes were studied for application on polyester, nylon and wool fabrics as azo disperse dyes. AA

Colletia spinosissima

1317

Zygadlo (JA) and Guzman (CA). **Chemical composition of *Colletia spinosissima* seeds.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 95-96

Colletia spinosissima is a small shrub of the Argentina forest. Oil and protein contents were 500 and 250 g/kg, respectively. The major fatty acids in the oil were oleic (448 g/kg), linoleic (232 g/kg) and linolenic (151 g/kg). Sitosterol was the main component of the sterol fraction. BV

Cottonseeds

1318

Liadakis (GN), Floridis (A), Tzia (C) and Oreopoulou (V). **Protein isolates with reduced gossypol content from screw-pressed cottonseed meal.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 918-922

Gossypol was removed from cottonseed meal by successive extractions with organic solvents. 1-Butanol hydrochloride was found the most suitable solvent, reducing free gossypol content to the safe level of 0.0104% after 3 extractions. Protein isolates, with a protein content of 85%,

were produced from raw and butanol-treated meals with yields of 50-80% based on extracted proteins. The isolates were light coloured and had a bland flavour. The butanol treatment influenced protein isolation yield, lowering protein extractability, as confirmed by chromatographic analysis, but did not affect significantly functional properties of the proteins. AA

Groundnuts

1319

Hashim (IB), Koehler (PE) and Eitenmiller (RR). **Tocopherols in runner and virginia peanut cultivars at various maturity stages.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 633-635

1320

Clavero (MRS), Hung (YC), Beuchat (LR) and Nakayama (T). **Separation of aflatoxin-contaminated kernels from sound kernels by hydrogen peroxide treatment.** *Journal of Food Protection* 56(2); 1993; 130-133, 156

Blends (0:1, 1:3, 1:1 and 3:1, wt./wt.) of aflatoxin-contaminated and sound peanut kernels were submerged for 1, 2 and 3 min in various concn. of H_2O_2 sol. Effectiveness of these treatments in separating aflatoxin-contaminated kernels from sound kernels was determined. Peanuts that floated (floaters) and those that did not (sinkers) were subjected to aflatoxin analysis. 2nd order polynomial equations were satisfactorily fitted to experimental data. H_2O_2 concn. of 0.075, 0.150 and 0.25% resulted in a reduction in aflatoxin content in the kernels in the sinker fraction by 90% within 1 min, regardless of the initial aflatoxin content. The total aflatoxin content in sinker and floater fractions was approx. the same as that in unfractionated samples, indicating that the low concn. of H_2O_2 in treatment solutions did not degrade aflatoxin. Response surface methodology was used to generate contour plots which revealed optimum treatment conditions for giving a max. yield of the sinker fraction with low aflatoxin content. For peanuts containing 50 p.p.b. aflatoxin, optimum conditions were 0.08% H_2O_2 treatment for 0.7 min. This procedure results in a max. sinker fraction yield of 85.5% of the original lot with a residual aflatoxin content of less than or equal to 5 p.p.b. AA

1321

Bansal (U-K), Satija (DR) and Ahuja (KL). **Oil composition of diverse groundnut (*Arachis hypogaea* L.) genotypes in relation to different environments.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 17-19

Groundnut genotypes belonging to diverse growth habits, namely Spanish bunch, Virginia runner and Virginia bunch, were evaluated for oil content and fatty acid composition in 4 environments. Variability for oil content and fatty acids was significant, within as well as between growth habits, in all the environments. Oil content was independent of growth habit. However, the different fatty acid contents were related to growth habit. Both traits were significantly influenced by environmental fluctuations. Oleic acid concn. was highest in the genotypes belonging to Virginia runner, followed by that of Virginia bunch and a min. in the Spanish bunch type. This trend was reversed with respect to linoleic acid concn. Virginia runner genotypes, having a higher oleic/linoleic acid ratio, yielded a low iodine value oil which had a longer shelf life. The genotypes with Spanish bunch type of growth habit possessed a higher linoleic acid content and can be used as a source of refined oil. AA

1322

Clavero (MRS), Hung (YC), Beuchat (LR) and Nakayama (T). **Catalase content in peanut milk as affected by growth of *Aspergillus parasiticus*.** *Journal of Food Protection* 56(1); 1993; 55-57

Changes in catalase content and pH of peanut [*Arachis hypogaea* L. cv. Florunner] milk in which *Aspergillus parasiticus* was cultured were monitored over a 10-day period at 30°C. A 3- to 10-fold increase in catalase content was detected after 6 days incubation; while the content in uninoculated (control) peanut milk decreased by about 50% after 3 days incubation. The pH of uninoculated catalase-supplemented peanut milk increased from 6.7 to 9.2, whereas pH of inoculated

peanut milk remained essentially unchanged. Production of catalase by *Asp. parasiticus* and perhaps other moulds could be a basis for developing an H_2O_2 treatment for separating mould-contaminated kernels from sound kernels. AA

Rapeseeds

1323

Bielewicz (J), Cenkowski (S) and Muir (WE). **Pretreatment effects on equilibrium moisture contents of canola.** *Journal of Stored Products Research* 29(1); 1993; 37-44

Equilibrium moisture content (e.m.c.) tests were conducted at 25°C for canola samples (*Brassica napus* L., cv. Westar) grown at different locations and in different yr. The effects of different storage pretreatments (long-term compression stress, irradiation and drying/rewetting cycles) on the e.m.c. characteristics of canola and its hysteresis loop were also investigated. Canola harvested at different locations in the same yr showed differences in e.m.c. properties and in its hysteresis loop; the difference in e.m.c. between adsorption in these samples was 0.9% dry basis. Canola e.m.c. behaviour was not affected by long-term compression stress or by irradiation with a 10 kGy dose. Drying and rewetting caused a widening of the hysteresis loop, possibly due to heat damage, development of cracks and fungal growth. BV

Soybeans

Soy products

Soy milk

1324

Tuitemwong (P), Erickson (LE), Fung (DYC) and Tuitemwong (K). **Effect of processing temperatures on microbiological and chemical quality of soy milk produced by rapid hydration hydrothermal cooking.** *Journal of Food Processing and Preservation* 17(3); 1993; 153-175

Soy milk samples produced from 11% soybean slurry by the rapid hydration hydrothermal cooking (RHHTC) process (temp. from 105-157°C for 24-90 s) were studied for sterility, microbiological quality, flatulent sugar reduction and physical characteristics. Soy milk produced at a temp. of 132 C, or higher, for 29 s or longer was sterile. Bacteria (including cells and spores of *Pseudomonas aeruginosa*, *Serratia liquefaciens*, *S. rubidaea* and *Enterobacter cloacae*) were completely destroyed. At lower temp. 105-127°C, Gram negative bacteria were destroyed; however, spores of the Gram positive bacteria *Bacillus licheniformis* and *B. cereus*, survived processing temp. Temp. of 143-157°C combined with a retention time for soy slurry solids of 30 s or longer are recommended to serilize soymilk. Mean residence time of soy solids processed by the RHHTC unit was 30 s. AA

Soy proteins

1325

Jie (Z), Tung (C-L) and Chi (T-H). **Kinetics and mechanism of nonenzymatic deamidation of soy protein.** *Journal of Food Processing and Preservation* 17(4); 1993; 259-268

Nonenzymatic deamidation of glutamine and asparagine residues of soy protein (SP) in aqueous solutions of varying pH (3.0, 5.0, 7.0, 9.0 and 11.0) at different temp. (100, 115 and 130°C) was monitored over a period of time. Deamidation of SP followed 1st-order kinetics. Activation energies (Ea) of SP deamidation at different pH ranged from 14 to 27 Kcal/mol. Activation energies were highly pH-dependent and decreased very sharply as pH increased from 5 to 11. AA

1326

Gifford-Steffen (SR) and Clydesdale (FM). **Effect of varying concentrations of phytate, calcium, and zinc on the solubility of protein, calcium, zinc, and phytate in soy protein concentrate.** *Journal of Food Protection* 56(1); 1993; 42-46

The phytate x Ca:Zn mmol ratio was varied in a number of soy protein concentrates subjected to sequential pH treatment to simulate

gastrointestinal conditions. In 2 independent studies, Ca was either decreased incrementally from 4.94 to 0.25 mmol or Zn was increased from 0.0036 to 0.55 mmol. At the lowest level of Ca, a significant increase ($P < 0.01$) in soluble Zn and soluble phytate was observed at pH 5.5, due to the possible formation of a soluble Ca-phytate-Zn complex. Soluble Zn significantly increased ($P < 0.01$) only when the level of Zn was raised to 0.55 mmol. Neither soluble Ca nor soluble phytate was altered at this level. AA

Soy sauce

1327

Iwasaki (K), Nakajima (M) and Sasahara (H). **Rapid continuous lactic acid fermentation by immobilised lactic acid bacteria for soy sauce production.** *Process Biochemistry* 28(1); 1993; 39-45

Continuous lactic acid fermentation was carried out to produce an appropriate feed solution for rapid ethanol fermentation in soy sauce production. Lactic acid bacteria, immobilized in porous alumina ceramic beads, were used to ferment a filtered extract of soy sauce mash. Lactic acid concn. was controlled by dilution rate. Volumetric production rate was dependent on dilution rate but was much higher than in batch fermentations. Lactic acid productivity was modelled mathematically. Simulated results were in close agreement with experimental results. AA

Soybean meal

1328

Velisek (J), Ledahudcova (K), Kassahun (B), Dolezal (M) and Kubelka (V). **Chlorine-containing compounds derived from saccharides in protein hydrolysates. II. Levulinic acid esters in soybean meal hydrolysates.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 430-433

Volatile compounds in traditionally manufactured soy meal hydrolysates (used as food seasonings and savoury flavours), as well as in hydrolysates treated with alkali, were analysed and quantitated by GC and GC-MS. Two isomeric esters, 3-chloro-2-hydroxy-1-propyl and 3-chloro-1-hydroxy-2-propyl levulinate were identified and were present at a level of 0.6-1.1 mg/kg. The esters were derived from 3-chloro-1,2-propanediol arising from residual lipids and levulinic acid formed via 5-hydroxymethyl-2-furancarboxaldehyde from saccharides. The esters totally decomposed in alkaline media. BV

Tofu

1329

Fouad (KE) and Hegeman (GD). **Microbial spoilage of tofu (soybean curd).** *Journal of Food Protection* 56(2); 1993; 157-164

Plate counts and pH measurements were performed on tofu samples stored for 1, 30, 37, 62 and 101 days at 2-3°C. pH declined from 5.8 to 5.2 during storage. Aerobic plate counts of 1 and 30 day old samples were approx. 10^6 cfu/g. Older [63 and 101 day] samples had counts of approx. 10^8 cfu/g. Anaerobic counts rose from 10^6 cfu/g in the 1 day old samples to a high of 10^9 cfu/g in the 30 day old samples. Major bacterial spp. were lactic acid bacteria, enteric bacteria and *Pseudomonas* spp. Representatives from each of these groups were inoculated into autoclaved tofu and incubated at 5°C for 23 days. Values of cfu/ml and pH for both water and cake were also measured. Turbidity, mg protein/ml and mg NH_4^+/ml water were also measured. All spp. tested increased in numbers in the tofu and caused changes in some of the characteristics measured. Samples were taken during manufacture of tofu, and organisms found were characterized. All organisms that were shown capable of causing spoilage in tofu were present in large numbers early in the manufacture but were no longer found in samples subsequent to pressure cooking. All spoilage organisms reappeared later during the manufacture process. These data indicate that tofu is spoiled by enteric bacteria and *Pseudomonas* spp., as well as by lactic acid bacteria. Spoilage organisms are probably introduced by equipment and personnel with which the product comes into contact after it is pressure cooked. In addition, aerobic plate counts can underestimate the bacterial load in tofu, and therefore anaerobic plate counts should also be performed. CSA

TUBERS AND VEGETABLES

Cassava

1330

Adewusi (SRA) and Bradbury (JH). **Carotenoids in cassava: comparison of open-column and HPLC methods of analysis.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 375-383

Cassava leaves and tubers from 6 cv. were analysed for carotenoids by both open-column chromatography and HPLC. The major carotenoids of leaves were the non-vitamin A carotenoid lutein (86-290 mg/kg fresh wt. (FW)). Immature leaves contained less than mature leaves. Tubers contained 0.1-3 mg/kg FW of β-carotene and 0.05-0.6 mg/kg FW of lutein. Carotenoids present in small amounts included α-, γ-, and zeta-carotenes and β-cryptoxanthin and others were separated and partially identified. Yellow tubers contain much more β-carotene than white tubers and cassava is a good source of pro-vitamin A carotenoids compared with other root crops. Both methods gave similar results for β-carotene and lutein, but the open-column method did not allow separation and quantitation of carotenoids present in small amounts. HPLC separated many carotenoids, but most peaks could not be identified for lack of reference compounds. A great advantage of open-column chromatography for developing countries is its use of simple equipment and readily available reagents and solvents compared with HPLC, which requires complex equipment needing careful maintenance and expensive solvents. The open-column method is more labour intensive but this is not a constraint in developing countries. AA

Potatoes

1331

Mondy (NI) and Munshi (CB). **Effect of type of potassium fertilizer on enzymatic discoloration and phenolic, ascorbic acid, and lipid contents of potatoes.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 849-852

Two sources of potassium fertilizer, KCl and K_2SO_4, were compared as to their effect on enzymic discoloration and phenolic, ascorbic acid and lipid concn. of Ontario and Pontiac potatoes. Each K source was applied at the rate of 627.2 kg/ha K_2O equivalent prior to planting of seed potatoes. Both sources of K fertilization significantly ($P < 0.01$) decreased enzymic discoloration and phenolic concn. and increased ascorbic acid, lipid and water contents of both Ontario and Pontiac cv. Greater changes occurred using KCl than with K_2SO_4. AA

1332

Brandon (DL), Binder (RG), Wilson (RE) and Montague (WCJr). **Analysis of thiabendazole in potatoes and apples by ELISA using monoclonal antibodies.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 996-999

Thiabendazole [2-(4-thiazolyl)- 1H-benzimidazole, TBZ] is used as a preharvest or postharvest fungicide on pome fruits, citrus, bananas, potatoes and several other commodities. An ELISA method was developed for detection of thiabendazole. Antibodies were elicited using the hapten 5-succin amido-2-(4-thiazolyl)benzimidazole. TBZ is extracted from samples using water or aqueous buffers. The method can be completed within 4 h. Results were validated by comparison with chromatographic fractionation with UV detection. The ELISA method using aqueous extraction of apple or potato peel had a limit of detection of < 0.2 p.p.m. Since US federal tolerances for residues of TBZ in potatoes and apples are 10 p.p.m., this rapid screening test has sufficient sensitivity for regulatory monitoring of residues. AA

1333

Onyeneho (SN) and Hettiarachchy (NS). **Antioxidant activity, fatty acids and phenolic acids compositions of potato peels.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 345-350

The effects of freeze-dried extracts from the peels of 6 potato var. as antioxidants in pure soybean oil were investigated using the active

oxygen method (AOM) procedure, carotene bleaching and linoleic acid oxidation experiments on TLC plates. At 9 h under AOM conditions, 20 g soybean oil treated with 0.05 g of these extracts attained lower peroxide values (PV, 22.0-28.0 meq kg^{-1}) than the control oil sample (PV, 109.0 meq kg^{-1}) indicating very strong antioxidant activities. Oils treated with the same amount of TBHQ, BHA-BHT mixture and rosemary extract attained PV of 10.0, 19.0 and 16.0 meq kg^{-1}, respectively. Results of the carotene bleaching and linoleic acid oxidation experiments on TLC plates indicated that the antioxidant activities of these extracts were due to the presence of phenolic acids. Among the phenolic acids separated and identified by both HPLC and TLC, chlorogenic, protocatechuic and caffeic acids were predominant and appeared to be mainly responsible for the strong antioxidant activities of the extracts. Peels from the red potatoes contained more polyphenols than those from the brown-skinned var., but their oil contents were similar. AA

Vegetables

1334

Chen (BH), Chuang (JR), Lin (JH) and Chiu (CP). **Quantification of provitamin A compounds in Chinese vegetables by high-performance liquid chromatography.** *Journal of Food Protection* 56(1); 1993; 51-54

The provitamin A contents of 16 vegetables grown in Taiwan were analysed by HPLC with photodiode-array detection. The amounts of the major provitamin A compounds, β-cryptoxanthin, α-carotene and β-carotene were 0-6.8, 0-27.7 and 0.6-104.9 μg/g, respectively. The highest β-carotene content (μg/g) was found in basil (104.9), followed by onion fragrant (92.0), kale (70.3), carrot (53.8), spinach (26.1), water convolvulus (19.8), mustard (16.0), green onion (15.1), garland chrysanthemum (12.8), sweet potato (8.5), green pepper (2.9), yellow corn (2.5), mustard stem (2.3), lettuce (1.7), cabbage (0.9) and celeriac (0.6). Carrot was the only vegetable found to contain α-carotene (27.7 μg/g) while corn was the only vegetable to contain β-cryptoxanthin (2.9 μg/g). AA

Asparagus

1335

Lescano (G), Narvaiz (P) and Kairiyama (E). **Gamma irradiation of asparagus (*Asparagus officinalis*, var. Argenteuil).** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 411-416

The effect of γ-radiation to improve the keeping quality of Argenteuil asparagus spears was investigated, under the packaging and storage conditions in which it is usually exported from Argentina. Asparagus, packaged in polystyrene foam trays and wrapped with PVC film, was irradiated 1 day after harvest with 0, 1.0, 1.5 and 2.0 kGy, and stored at 3 plus/minus 2°C and 92 plus/minus 5% RH. Bract and stem growth, desiccation and appearance of visible fungal mycelia were delayed by irradiation; colour and flavour were also maintained. Shelf-life of the asparagus was doubled when a dose of 2 kGy was used. During storage, wt. loss increased linearly; however, there were no significant differences between control and irradiated samples. In irradiated samples, shear force and acidity values were slightly higher than those of the control, particularly towards the end of storage. Mesophilic bacteria, fungi and yeasts were reduced by greater than 3 orders of magnitude when the 2 kGy irradiation treatment was used; levels remained the same during storage. BV

Bell peppers

1336

Gonzalez (G) and Tiznado (M). **Postharvest physiology of bell peppers stored in low density polyethylene bags.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 450-455

Physiological effects of waxing and modified atm. packaging were studied on the market quality of peppers (*Capsicum annuum* L.). The mature green peppers were stored at 10°C and 75% RH using 2 LDPE films. The thickness and permeability to O_2 and water vapour of the films were determined. At 3-day intervals, O_2 and CO_2 levels in the pack atm. were determined. At 10-day intervals, peppers were assessed for changes in colour, wt. loss, soluble solids, titratable acidity, pH, % decay and sensory

properties. Fruit senescence was delayed in waxed and packaged peppers, and change of colour, wt. loss, firmness and % decay were reduced compared to waxed and unwrapped peppers. No abnormal flavours were detected in peppers stored at 10°C for up to 40 days. Results indicate that use of waxing together with packaging in LDPE bags can prolong shelf life without affecting quality. BV

Brinjal

1337

Raha (P), Banerjee (H), Das (AK) and Adityachaudhury (N). **Persistence kinetics of endosulfan, fenvalerate, and decamethrin in and on eggplant (*Solanum melongena* L.).** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 923-928

Persistence studies of endosulfan, decamethrin and fenvalerate in and on fruits and leaves of aubergines under field conditions of eastern India were undertaken after spraying at the recommended and twice recommended rates. Initial deposits of applied insecticides were higher on leaves than on fruits. Residues of endosulfan and fenvalerate in and on fruit were below the tolerance level of 2 p.p.m. as specified by FAO/WHO immediately after application at the recommended rate, whereas decamethrin required 4.32 days to decrease to below the tolerance level. Waiting periods (defined as the time required to decrease the residue to below the tolerance level) of 2.57, 6.50 and 0.14 days were calculated for endosulfan, decamethrin and fenvalerate, respectively, when double the recommended rate was applied. Approx. 50-70% of remaining insecticide residues were dissipated during washing followed by cooking. AA

Cocoyam

1338

Nwana (IE). **A survey of storage *Coleoptera* which attack dried cocoyam chips in Nigeria.** *Journal of Stored Products Research* 29(1); 1993; 95-98

In a survey of 5 storage locations in Anambra State, Nigeria, 13 spp. from 11 families of the *Coleoptera* were isolated from dried cocoyam chips. These included primary grain pests such as *Araecerus fasciculatus*, *Dinoderus procellus*, *Rhizopertha dominica*, *Sitophilus zeamais* and *Tenebroides mauritanicus*, bran and flour beetles like *Brachypelus pilosellus*, *Tribolium castaneum* and *Tribolium confusum*, and 2 other spp. *Dermestes maculatus* and *Necrobia rufipes* commonly associated with dried fish and meat. This suggests severe cross infestation which normally results from poor storage and transporation conditions, and implies serious problems for future processing and storage of the product. In tests cocoyam chips were similar as a food material to other root crops, (yam and cassava) for the development of *A. fasciculatus*, *Dinoderus procellus*, *S. zeamais* and *Tribolium castaneum* but were not as good as cowpea or maize. In the light of increased interest in dried cocoyam products for nonfood applications, the economic significance of insect damage to cocoyams is stressed. BV

Tomatoes

1339

Rodriguez (JH), Cousin (MA) and Nelson (PE). **Thermal resistance and growth of *Bacillus licheniformis* and *Bacillus subtilis* in tomato juice.** *Journal of Food Protection* 56(2); 1993; 165-168

Research was conducted to assess the thermal stability of spores of acid tolerant *Bacillus licheniformis* and *B. subtilis* in tomato juice. D values at 90, 95 and 100°C were 29.5, 15.8 and 5.7 min for *B. subtilis* and 29.9, 12.2 and 5.9 min for *B. licheniformis*, respectively. The z value for *B. subtilis* was 14°C and for *B. licheniformis* 14.2°C. Aerobically, *B. subtilis* spores could germinate and outgrow in tomato juice (pH 4.4) within 4 days at 35°C at inoculum levels as low as 1 spore/ml; *B. licheniformis* spores could only germinate and outgrow if levels were > 10^{-4} spores/ml. Both *Bacillus* spp. could raise the pH of tomato juice to > 4.8 when grown aerobically. Neither *B. licheniformis* nor *B. subtilis* could germinate and outgrow anaerobically in tomato juice (pH 4.4). CSA

FRUITS

Apples

1340

Drake (SR), Eisele (TA) and Waelti (H). **Controlled atmosphere storage of Delicious apples in high and variable carbon dioxide.** *Journal of Food Processing and Preservation* 17(3); 1993; 177-189

Two strains of Delicious apples were held in controlled atm. (CA) storage at various CO_2 levels for 9 months before removal and evaluation. Oxygen in all atmospheres was 1%, and CO_2 levels were 1, 3 or 5% with an additional CO_2 treatment that was increased every 6 wk from 1 to 5% over the storage period. Storage temp. for all treatments was 1°C. Little quality difference was noted for the Delicious apples immediately after storage or after an 8 day ripening period regardless of CO_2 level in storage. Mean values for firmness, external and internal colour, soluble solids content, titratable acidity and amount of scald did not differ between the apples from the different storage treatments. Total carbohydrates and fructose were higher in apples stored at CO_2 levels greater than 1%. Sensory panelists found no flavour differences in apple juice after long term CA storage regardless of CO_2 storage level. AA

Cherries

1341

Amitabh (C) and Nair (MG). **Characterization of pit oil from Montmorency cherry (*Prunus cerasus* L.).** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 879-881

Triolein, 1,2,3-tri-(Z)-9-octadecenoylglycerol, has beeen reported as a constituent of the purified pit oil from Montmorency cherry (*P. cerasus* L.). Clarified kernel oil from Michigan tart cherries, P. cerasus L. var. Montmorency, consisted of a single product 1,3-di[(Z)-9-octadecenoyl]-2-[(Z,Z)-9,12-octadecadienoyl]glycerol (I). Triolein was not present in the Montmorency cherry pit oil in detectable quantities. The structure of (I) was elucidated by chemical and spectral methods and by direct comparison with triolein. The fatty acids present in Montmorency pit oil were identified as oleic (63.6%) and linoleic (31.5%) acids by spectral and GC analyses. Thermal stability of the Montmorency cherry pit oil was also investigated by thermal gravimetric analysis against apricot, canola, vegetable, olive and safflower oils and was found to be higher than or equal to that of all oils studied. Results also indicate that the cherry pit oil may be of use for cooking. BV

Grapes

1342

Elmaci (Y) and Altug (T). **Sugars in grape molasses: a comparison of Lane-Eynon and HPLC method.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 53-54

The HPLC method was found to be more rapid, accurate, and reproducible than the Lane-Eynon method and was able to detect sucrose adulteration. Av. levels of 26.1% fructose, 26.3% glucose and 52.5% total reducing sugars were determined. BV

1343

Morales (M), Pedreno (MA), Munoz (R), Ros (B-A) and Calderon (AA). **Oxidation of flavonols and flavonol glycosides by a hypodermal peroxidase isoenzyme from Gamay Rouge grape (*Vitis vinifera*) berries.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 385-391

Ability of the grapevine hypodermal peroxidase isoenzyme B5 to oxidize the flavonols, quercetin and myricetin, and the flavonol glycosides quercetin-3-arabinoside, quercetin-3-rhamnoside (quercitrin) and myricetin-3-rhamnoside (myricitrin) was studied. Results showed that, whilst the aglycones were good substrates of this peroxidase isoenzyme, their corresponding glycosides were poorly oxidized under the assay conditions. The oxidation of quercetin and myricetin catalysed by the hypodermal peroxidase isoenzyme B5 was strictly dependent on H_2O_2. Kinetic characteristics of the flavonol oxidation were also studied. Whilst

the apparent K_m values for quercetin and myricetin were roughly equal (38 and 54μM, respectively), the apparent K_m values for H_2O_2 in each reaction were appreciably different (168 and 8μM, respectively). The optimal pH for quercetin oxidation was 4.0 whereas for myricetin it was 6.0-7.0. Results are discussed in view of the possible involvement of the vacuolar hypodermal β_5 isoperoxidase in the turnover of flavonol and flavonol glycosidises in grapes. AA

Raspberry

1344

Werkhoff (P), Brennecke (S) and Bretschneider (W). **Enantiomeric composition of γ-decalactone in raspberry flavor.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 47-52

Detn. of the enantiomeric composition of γ-decalactone (γ-dl) in raspberry flavour by means of chirospecific multidimensional capillary GC is described, using heart-cutting techniques from DB-WAX as the preseparation column onto Lipodex D [heptakis-(3-O-acetyl-2,6-di-O-pentyl)-β-cyclodextrin] as the chiral stationary phase. The method was used to establish the naturally occurring enantiomeric distribution of γ-dl in raspberry fruits of different origins as well as in raspberry fruit juice concentrates. Chirality evaluation of γ-dl revealed either a significant excess in favour of the (+)-(R)-configurated enantiomer or a racemic distribution. The natural enantiomer composition of γ-dl depends on its concn. in raspberry samples. Higher amounts of γ-dl in raspberry flavour always showed a clear predominance of the (+)-(R)-configured form whilst γ-dl present as minor constituent mainly indicated a nearly racemic mixture. AA

CONFECTIONERY, STARCH AND SUGAR

Confectionery

Chocolates

1345

Mans (J). **Sweet automation.** *Prepared Foods* 162(1); 1993; 58-61

The new Ambrosia Chocolate plant in Milwaukee, Wisconsin, USA, is described, which combines the latest in-plant computer technology to control its production operations with a computer integration manufacturing system that enables the company to track deliveries, orders and production status. BV

Starch

1346

Jarvis (CE) and Walker (JRL). **Simulataneous, rapid, spectrophotometric determination of total starch, amylose and amylopectin.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 53-57

A novel spectrophotometric method for the simultaneous measurement of total starch, amylose and amylopectin in lipid-free samples was developed using a diode-array spectrophotometer. The method involves measurement of the spectrum of the amylose/amylopectin-iodide complexes at 6 wavelengths and calculation of amylose and amylopectin concn. using multi-component analysis and a spreadsheet computer program. This method appears to offer some advantages to previous 'iodine-blue colour' assays for the measurement of amylose. AA

1347

Ferrero (C), Martino (MN) and Zaritzky (NE). **Stability of frozen starch pastes: effect of freezing, storage and xanthan gum addition.** *Journal of Food Processing and Preservation* 17(3); 1993; 191-211

Starch pastes act as protective systems of the solid elements in precooked frozen foods, minimizing their dehydration and chemical changes during storage. Effect of xanthan gum (0.3% w/w) on corn starch and wheat flour pastes (10% w/w), frozen at different freezing rates and stored between -5 and -20°C, was analysed. Freezing modified the quality attributes of starch pastes increasing exudate production, structure deterioration and rheological changes compared to unfrozen samples. Starch pastes showed a

pseudoplastic behaviour and apparent viscosities decreased in frozen samples. High freezing rates led to smaller ice crystals (indirect microscopic observation) and the absence of starch retrogradation. Starch retrogradation and ice recrystallization both contributed to deterioration of the frozen paste during storage (spongy structure, marked decrease of apparent viscosity and increase of syneresis). Addition of xanthan gum minimized spongy structure formation, exudate production and rheological changes; however, no protective effect was observed on ice crystal sizes and on amylopectin retrogradation by DSC. AA

BAKERY PRODUCTS

1348

Radhakrishnan (KL). **Utilization of wheat - innovative bakery products.** *Indian Miller* 24(1); 1993; 90-93

Nutritive value of bakery products (bread, biscuits, crisp bread/flat bread, cakes and confectionery items, doughnuts, puff pastry), their importance in the daily diet and health baked foods are described. SRA

1349

Bhavsar (PC) and Agrawal (BC). **Raw materials and its quality standards for bakery industry.** *Indian Miller* 24(1); 1993; 94-100

Aspects on flour (milling), type of wheat flour composition, quality characteristics (fats and oils, butter oils, milk, salt, water, sugar, yeast, mould inhibitors, baking powder, colours and flavours, eggs) are detailed. SRA

1350

Patel (HG) and Jana (AH). **Dairy ingredients in bakery products - a review.** *Beverage and Food World* 21(3); 1994; 14-19

This review covers aspects on technological properties of milk constituents in relation to baking properties (milk fat, milk proteins (casein, whey proteins), lactose, minerals), milk and milk products for baking industry (milk/skim milk, condensed milk, whole milk powders, non-fat dry milk, cream/dried cream, butter, butteroil/ anhydrous milk fat, fractionated butter fat, fat blends, whey/concentrated whey/whey powder, caseinates, whey protein concentrates, milk proteinates, lactose, lactose hydrolyzed whey products, cheese/cheese powder and yoghurt/yoghurt powders). SRA

1351

Friedman (M). **Grain-based products promote 'well-bred' bodies.** *Prepared Foods* 162(1); 1993; 49

Development of cereal-based products is described. Products covered include: multi-grain breads, cereals and crackers; rice and pasta side dish mixes; whole wheat baking mixes; amaranth grain products (pancake and waffle mix, granolas, crispbreads and snack bars); spelt grain products (organic hot cereals, cinnamon-raisin bread, hot-dog rolls and bagels, dry pasta, pancake and muffin mix); quinoa based products; kamut grain products (cereals, flakes, flour, pasta); products containing teff, a mini-grain which is high in protein, iron and calcium; products containing triticalè, a hybrid of rye and wheat; and products containing a combination of grains. BV

1352

Prinyawiwatkul (W), Beuchat (LR) and Resurreccion (AVA). **Optimization of sensory qualities of an extruded snack based on corn starch and peanut flour.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 393-399

The formulation of an extruded snack food based on corn starch and peanut meal, using response surface methodology, was investigated. Consumer preferences for various flavoured and unflavoured snack foods were also determined. Formulations containing 120-200 g/kg non-fermented peanut meal, 0-80 g/kg fermented peanut meal, 300-315 g/kg water and 500 g/kg corn starch were found to be acceptable. Overall product acceptability was enhanced by adding flavourings (nacho cheese, Cheddar cheese and sour cream). The snacks were considered to have a high potential for sale in the

marketplace, as judged by consumer evaluation. BV

Biscuits

1353

Rahi (SK). **Indian standards for wheat flour and biscuit industries.** *Indian Miller* 24(1); 1993; 101-104

Certification marks scheme, hygienic conditions (site and building maintenance, store room), factory and processing hygiene (equipment and container cleanliness, water, employee hygiene), packaging material (wax-coated paper, polyethylene films), testing (sensory and physico-chemical testing procedures), marketing and sampling according to Indian Standards are covered. SRA

Bread

1354

Bhavsar (PC) and Agrawal (BC). **Quality problems in bread and its remedies.** *Indian Miller* 24(1); 1993; 115-119

Some of the defects, spoilage problems in bread and remedial measure are discussed. Aspects covered are defects in crust colour, grain, symmetry, break and shred, texture, poor taste, aroma and spoilage. SRA

1355

Amarjeet (K), Bhupendar (S) and Sidhu (JS). **Studies on bread and durum wheat blends.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 35-40

Bread wheat (BW) and durum wheat (DW) grains blended in different proportions (100:0, 80:20, 60:40, 40:60, 20:80, 0:100) were milled into flour and *atta* (Indian whole meal flour) for use in bread, cookie and chapati making. An increase in protein, ash, reducing sugars, non-reducing sugars and free fatty acids and a decrease in starch content with increasing proportion of DW in the flour blends was noticed. Fat contents increased with increasing proportion of DW in the unmilled blends but decreased in flour blends. Diastatic activity, damaged starch, and farinograph water absorption increased whereas stability of dough decreased with increase of durum flour in the blend. Good quality bread and cookies could be prepared with wheat and durum flour blend in 60:40 ratio. Acceptable chapati could be prepared from *atta* or flour obtained from 40% *bread wheat* and 60% durum wheat. BV

1356

Faid (M), Boraam (F), Achbab (A) and Larpent (JP). **Yeast-lactic acid bacteria interactions in Moroccan sour-dough bread fermentation.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 443-446

The interactions of lactic acid bacteria (LAB) and yeasts in pure cultures for sourdough fermentation was studied; growth patterns of both microorganisms were determined during fermentation. Physicochemical properties of the dough, including pH drop, titratable acidity increase and dough rising capacity, were also assessed. The mixed cultures contained *Candida milleri*, *Saccharomyces cerevisiae*, *Lactobacillus plantarum* and *L. brevis*. Cultures were used in 4 combinations in wheat flour dough fermentation (each LAB sp. with each yeast sp.). Results showed that *L. plantarum* was as active as *L. brevis* in acidification of the dough. Dough made with *Sacch. cerevisiae* and *L. plantarum* leavened the best; dough rising capacity was high. When *Sacch. cerevisiae* was combined with *L. brevis*, a net decrease in the dough rising capacity was observed; acidification, however, was comparable. *Sacch. cerevisiae* was more resistant to the effects of the LAB than *C. milleri*. Combinations of *L. plantarum* with either *C. milleri* or *Sacch. cerevisiae* gave the best overall results. BV

MILK AND DAIRY PRODUCTS

1357

Criado (M-T), Saurez (B) and Ferreiros (CM). **The importance of bacterial adhesion in the dairy industry.** *Food Technology* 48(2); 1994; 123-126

Befouling of dairy equipment causes serious sanitation and economic problems as well as decreases the effectiveness of biocidal

treatments. Aspects covered are bacteria and surface interactions, preventing microbial contamination, adhesion in the dairy industry and evaluation of bacterial adhesion. CSA

1358

Moineau (S), Pandian (S) and Klaenhammer (TR). **Restriction/modification systems and restriction endonucleases are more effective on lactococcal bacteriophages that have emerged recently in the dairy industry.** *Applied and Environmental Microbiology* 59(1); 1993; 197-202

Recently, 8 lytic small isometric-headed bacteriophages were isolated from cheese-manufacturing plants throughout North America. The 8 phages were different, but all propagated on 1 strain, *Lactococcus lactis* NCK203. On the basis of DNA homology, they were classified in the P335 species. Digestion of their genomes in vitro with restriction enzymes resulted in an unusually high number of type II endonuclease sites compared with the more common lytic phages of the 936 (small isometric-headed) and c2 (prolate-headed) species. In vivo, the P335 phages were more sensitive to 4 distinct lactococcal restriction and modification (R/M) systems than phages belonging to the 936 and c2 species. A significant correlation was found between the number of restriction sites for endonucleases (purified from other bacterial genera) and the relative susceptibility of phages to lactococcal R/M systems. Comparisons among these 3 phage species indicate that the P335 species may have emerged most recently in the dairy industry. AA

Milk

1359

Rashda Ali and Syed Asad Sayeed. **Effect of aflatoxin - contaminated feeds on buffalo milk.** *Indian Food Industry* 12(2); 1993; 38-40

The study deals with the detection and estimation of aflatoxin B_1 in feed, composed of cottonseed, decayed bread and husk. Its presence in buffalo milk consuming the contaminated feed indicated the adverse effects of aflatoxins in food chain. CSA

1360

Freitas (AC), Nunes (MP), Milhomem (AM) and Ricciardi (ID). **Occurrence and characterization of *Aeromonas* species in pasteurized milk and White cheese in Rio de Janeiro, Brazil.** *Journal of Food Protection* 56(1); 1993; 62-65

A total of 35 samples (1000 ml each) of pasteurized milk and 25 samples (100 g each) of White cheese purchased at supermarkets in Rio de Janeiro were analysed for the presence of *Aeromonas*. Strains of *Aeromonas* were isolated from 28.5% of pasteurized milk and 32% of White cheese samples. Standard plate counts in the pasteurized milk samples ranged from 7.2×10^4 to 2.5×10^5 cfu/ml. Total and faecal coliform counts in White cheese samples ranged from 1.9×10^4 to 2.4×10^5 MPN/g and 3.2×10^2 to 1.2×10^5 MPN/g, respectively. *A. caviae* (58.9%), *A. hydrophila* (12.8%) and *A. schubertii* (2.5%) were identified among cultures isolated from pasteurized milk samples. 25% of the strains could be classified only as *Aeromonas* spp. In White cheese samples, unclassified strains were the most frequent isolates (61.5%) followed by *A. hydrophila* (26.9%), *A. caviae* (7.6%) and *A. sobria* (3.8%). Only strains of *A. hydrophila* and *A. sobria* showed high rate of positive results when tested for the production of haemolysin, cytotoxin and staphylolytic activity. Heat-stable enterotoxin and autoagglutination tests did not correlate as virulence factors. The presence of *Aeromonas* sp. in refrigerated food samples suggested that this microorganism could be a potential foodborne pathogen, and dairy products may represent an important vehicle of its transmission. AA

1361

Mosteller (TM) and Bishop (JR). **Sanitizer efficacy against attached bacteria in a milk biofilm.** *Journal of Food Protection* 56(1); 1993; 34-41

The objectives of this study were to evaluate efficacy of in-use concn. of sanitizers on bacteria attached to gaskets in dairies; compare bacterial attachment to rubber vs. Teflon gaskets; examine different methods of bacterial enumeration; and compare sanitizer efficacy on attached and suspended bacteria. Results indicated that iodophore, hypochlorite,

acid anionic, peroxyacetic acid, fatty acid and quaternary ammonium sanitizers failed to provide adequate reduction in numbers of attached bacteria at levels of 10^4, $10^5/mm^2$. The test organisms (*Pseudomonas fluorescens*, *Yersinia enterocolitica* and *Listeria monocytogenes*) attached in slightly higher numbers to the rubber than the Teflon surfaces. Impedance microbiology permitted the estimation of both reversibly and irreversibly attached bacteria and was thus preferred to other enumeration methods tested, i.e., plate counts or the direct epifluorescent filter technique. Sanitizers were more effective against bacterial suspensions than against attached bacteria. On a Teflon surface, the iodophor, hypochlorite and fatty acid sanitizers provided > 3 log cycles or 99.9% reduction in numbers of *Y. enterocolitica*. Hypochlorite resulted in > 3 log/cycle reduction in numbers of *P. fluorescens* on both rubber and Teflon surfaces. CSA

Milk products

1362

Patel (AA) and Gupta (SK). **A new butter-flavoured low-fat spread.** *Indian Food Industry* 12(1); 1993; 28-31

The newly developed low-fat spread based on vegetable fat, soy concentrate and skim milk besides other minor ingredients which is a potentially valuable low-cost substitute for expensive table butter is described in this article. It offers more specific advantages from dietary and convenience points of view as it is free from cholesterol and low in saturated fat and has a remarkably improved spreadability. CSA

1363

Hatchwell (LC). **Overcoming flavour challenges in low-fat frozen desserts.** *Food Technology* 48(2); 1994; 98-100, 102

Aspects delt in this article are the basics of flavour, functional aspects of fat reduction, formulation of reduced-fat ice cream based on raw material quality, base characteristics, flavour systems, mouthfeeel flavours, fat flavours, dairy flavours, brown notes and flavour potentiators. Practical examples of vanilla and chocolate ice creams as flavour challenges in reduced-fat dairy systems are also presented. CSA

Cheese

Cheddar cheese

1364

Anjan Reddy (K) and Marth (EH). **Proteolysis in Cheddar cheese made with sodium chloride, potassium chloride or mixtures of sodium and potassium chloride.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 434-442

Proteolysis in salt-free Cheddar cheese and in Cheddar cheese prepared with NaCl, KCl or mixtures of both (2:1, 1:1, 1:2 and 3:4, wt. basis) was determined; and final salt concn. of 15.0 or 17.5 g/kg were achieved. Cheeses were ripened at 3 plus/minus 1°C and proteolysis was determined over a 36 wk period. During the ripening period, peptide material soluble in trichloroacetic acid (TCA), and free amino acids, measured as phosphotungstic acid (PTA)-soluble amino N, increased in all cheeses. After 12, 24 and 36 wk of ripening, no significant differences in levels of TCA-soluble N and PTA-soluble amino N attributed to the salt treatments were determined. More proteolysis was found to occur in unsalted cheeses. Cheeses were also made with either mixtures of *Lactococcus lactis* subsp. *lactis* and *L. lactis* subsp. *cremoris* (trial 1) or just *L. lactis* subsp. *lactis* alone (trial 2). Peptide extracts from cheeses of both trials were chromatographed using a Sephadex G-25 column. Sensory analysis revealed that only eluent fractions of cheese from trial 1 were slightly to markedly bitter. In trial 2, cheeses made with NaCl or NaCl/KCl mixtures were not bitter; however, fractions from unsalted cheeses were slightly bitter. Results indicate that KCl was not responsible for the bitterness found in cheeses from trial 1. BV

Feta cheese

1365

Papadopoulou (C), Maipa (V), Dimitriou (D), Pappas (C), Voutsinas (L), Malatou (H). **Behavior of *Salmonella enteritidis* during the manufacture, ripening, and storage of**

Feta cheese made from unpasteurized ewe's milk. *Journal of Food Protection* 56(1); 1993; 25-28

The ability of *Salmonella enteritidis* to grow during Feta cheesemaking and to survive during ripening and storage of the cheese was investigated. Unpasteurized whole ewes' milk was inoculated to contain 10^6 - 10^7 cfu/ml of *S. enteritidis* and was processed into Feta cheese following standard procedures. All samples were examined for *S. enteritidis* both quantitatively and qualitatively, while moisture, fat, a_w and pH values were also measured. *S. enteritidis* was enumerated in duplicate samples by surface plating on SS agar. Selected *Salmonella* colonies were identified biochemically and serologically. Enumerations showed that *S. enteritidis* was entrapped in curd with the population increasing to a max. during the first 48 h. Thereafter, growth of *S. enteritidis* was inhibited and surviving cells persisted in the curd for up to 20 days. AA

Goat's cheese

1366

Garrido (MP), Quintana (MA) and Barneto (R). **Microbiological and physico-chemical study of goat's cheese.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 11-13

Idiazabal cheese

1367

Perez (E-FJ), Albisu (M), Barron (LJR) and Barcina (Y). **Microbiological changes with brining time and smoking during the ripening of Idiazabal cheese.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 14-20

The effects of brining time (12, 24 or 36 h) and smoking on microbial growth during ripening of Idiazabal ewes' milk cheese for < 180 days were investigated. The microbial groups studied (including various bacterial groups, yeasts and moulds) showed differing growth trends, although, on the whole, counts tended to stabilize towards the end of ripening. Linear and non-linear regression analyses were applied to microorganism growth during cheese ripening. Analysis of variance and Student's t-test revealed significant differences during ripening between cheeses with different brining times and between smoked and unsmoked cheeses. This demonstrates the importance of these 2 processing steps for the final characteristics of Idiazabal cheese. BV

MEAT AND POULTRY

Meat

1368

Berwaj (JS) and Dinchev (D). **Microbial starter cultures for raw ripened meat products.** *Indian Food Industry* 12(6); 1993; 23-25

Traditional processing of raw ripened meat products involves naturally selected microorganisms existing in green rooms for ripening of the products. The natural course of ripening, however does not guarantee against the occurrence of defects in the product or against the microorganisms which cause food poisoning and spoilage. For regulating the microbiological processes to ensure products with stable colour, flavour and consistency and also hasten the production process, certain microbial starter culture preparations are used. The microorganisms mainly used as starter cultures are the strains of lactobacilli, micrococci, yeast and moulds. The method of preparation of the starter culture is also discussed in the article. CSA

1369

Sieber (R). **Cholesterol removal from animal food - can it be justified?.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 375-387

Reviews the methods for reduction of cholesterol in commonly eaten animal foods, which have been developed successfully over the past few yr with the aim of lowering dietary cholesterol. Aspects discussed include: cholesterol removal from foods; processes for cholesterol removal from foods (biological processes, physical processes (distillation and crystallization methods, supercritical fluid

extraction), chemical processes (solid-liquid extraction, complex formation)); cholesterol removal from different foods (eggs, fish, meat, milk and dairy products); cholesterol-reduced foods (a perspective); and effects of cholesterol in humans (influence of dietary cholesterol on serum cholesterol, further arguements against cholesterol removal from animal food). 181 references. BV

1370

Kavas (A) and Karakaya (S). **Effect of microwave and conventional cooking on nutritive value of semitendinosus muscle.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 30-34

The effects of cooking in a microwave (MO) or conventional oven (CO) on nutritive value and sensory properties of beef semitendinosus muscle (SM) was studied. Beef slices were either cooked for 14 min in a 2450 MHz 980 W MO or for 35 min at 170°C in an electric oven. Moisture, protein, riboflavin, niacin, pyridoxine, iron, Ca, and energy contents of SM cooked in the MO were higher than those of the meat cooked in electrical oven whereas fat content was lower. No significant differences were found between the 2 cooking methods for flavour and texture characteristics, although panellists preferred the appearance of the conventionally cooked samples. BV

Beef

1371

Kalchayanand (N), Ray (B) and Field (RA). **Characteristics of psychrotrophic *Clostridium laramie* causing spoilage of vacuum-packaged refrigerated fresh and roasted beef.** *Journal of Food Protection* 56(1); 1993; 13-17

A *Clostridium* sp., associated with an unusual spoilage of vacuum-packaged refrigerated uncooked (fresh) and roasted beef, was isolated as a pure culture from spores in spoiled beef. The pure culture was used to study important characteristics and to differentiate it from other clostridial spp. usually found in beef. The biochemical properties, volatile fatty acid and soluble-protein profiles, temp. and pHs of growth, and temp. of sporulation, germination and destruction of the isolate were distinctly different from other *Clostridium* spp. studied. It is not toxigenic and has 26% guanine plus cytosine. The isolate is a new sp. and is named *C. laramie*. AA

1372

Narasimhan (R), Rubin (LJ) and Diosady (LL). **Studies on meat flavor. IV. Fractionation, characterization, and quantitation of volatiles from uncured and cured beef and chicken.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 939-945

Volatile compounds from uncured and cured beef and chicken were trapped onto a solid adsorbent (Florisil cartridge) and in an organic solvent (pentane) using the nitrogen purge-and-trap (NPT) technique. 12 new compounds were identified. The newly identified compounds 4-ethyl-1-methylhexane, 1,1,3- trimethylcyclohexane, α-pinene, 4-ethyl-1,2- dimethylbenzene and 3,6-dimethylundecane were unique to beef. 7 components were identified in chicken but not in pork or beef. These included 1,2- dibutyl cyclopentane, 2,6-bis (1,1- dimethylethyl)-4-methylphenol and 1,12-dodecanediol. BV

Products

Frankfurters

1373

Lecomte (NB) and Zayas (JF). **Properties of batters and storage stability of frankfurters containing preemulsified fat stabilized with soy proteins.** *Journal of Food Processing and Preservation* 17(4); 1993; 287-304

Soy proteins (SPs) were incorporated into meat batters either as part of preemulsified fat (PEF) or as a powder. Batters made with PEF had higher viscosity, water holding capacity, adhesive properties and improved batter stability. During storage, experimental frankfurters had similar microbial counts, aw and TBA values; frankfurters containing SPs added as PEF had lower total volatile nitrogen than those samples with sp added as a powder. Samples containing PEF during 30 days of storage were less bitter and beany than those with powdered proteins. Incorporation of SP in

the PEF form improved functionality of sausage batters, and therefore, could increase the usage of SPs in comminuted meats. AA

Ham

1374
Buscailhon (S), Berdague (JL) and Monin (G). **Time-related changes in volatile compounds of lean tissue during processing of French dry-cured ham.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 69-75

Poultry

1375
Anon. **Salmonella treatment minimizes liabilities.** *Prepared Foods* 162 (2); 1993; 65

Use of Avgard trisodium phosphate (TSP), developed by Rhone-Poulenc Food Ingredients, New Jersey, USA, to significantly reduce, although not eliminate, the incidence of salmonellae and other foodborne pathogens on poultry is discussed. The TSP does not affect spoilage bacteria and, consequently, they can still behave as markers of poultry freshness. Treatment involves immersing the poultry for a few seconds in a solution of TSP near the end of the production operation. A separate dipping tank made of stainless steel is required as the solution will corrode aluminium tanks. Results indicate that no difference in taste, appearance and texture between treated and untreated chickens, in either raw, baked or fried form. BV

Chickens

Broilers

1376
Mahapatra (CM). **Further - processing of broilers.** *Indian Food Industry* 12(1); 1993; 32-33

Describes the rapid growth of fast-food industries with the demand for further processed poultry products for reasons of popularity, availablity and preference and the technologies available for further processing of poultry. CSA

Products

Eggs

1377
Crone (AVJ), Hand (MV), Hamilton (JTG), Sharma (ND), Boyd (DR), Stevenson (MH). **Synthesis, characterisation and use of 2-tetradecylcyclobutanone together with other cyclobutanones as markers for irradiated liquid whole egg.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 361-367

Synthesis and characterization of 2-tetradecylcyclobutanone (TCB) [the proposed product of irradiated stearic acid] are described [as a marker for irradiated liquid whole egg.] Both 2-dodecylcyclobutanone and TCB were shown to be present in liquid whole egg irradiated at doses of 2.5 and 10.0 kGy. These compounds were absent from unirradiated pasteurized samples. Using GC and spectroscopy, there was also evidence for the presence in irradiated egg of 2-tetradecenyl- and 2-tetradecadienylcyclobutanone which are formed from oleic and linoleic acids, respectively. Authentic standards for these unsaturated cyclobutanones were not available commercially but the presence of 2-tetradecenylcyclobutanone was substantiated by hydrogenating the egg extracts, so converting this unsaturated cyclobutanone to TCB. Saturated and unsaturated cyclobutanones appear to be specific products of irradiation and are potential markers for detection of irradiated liquid egg and probably other fat-containing foods. AA

SEAFOODS

1378
Devarajan (S). **An economic analysis of marine product export from India.** *Madras Agricultural Journal* 80(1); 1993; 23-27

Trend lines were fitted to predict the growth rate for marine product from India to other countries. Total marine product export

increased at 8.55% and the value by 22.56%. Share of shrimp to total marine product export increased from 54.0% in 1960 to 58.41% in 1986. While the value increased from 70.22 to 82.12% for the above period indicating the prawn forms major share. Market share analysis revealed that Japan and U.S.A. are the 2 major importers of marine products accounting for 44.85 and 12.96% while the value by 67.62 and 12.48% respectively. Since the prawn forms major share in marine product export, it is necessary to revitalise the industry by providing liberalised credit to processors to introduce new technologies by sophisticated machineries offering tax concessions to traders and arranging participation in the world fairs. AA

1379

Jose (VT) and Sherief (PM). **Glaze hardener - a new recruit to Indian seafood processing machinery.** *Seafood Export Journal* 25(9); 1993; 7, 9-10

Glaze hardener is a 'mini freezer' and operates at a temp. of -25°C or below. The product immediately after glazing is fed into this machine and this causes the temp. of the product to go below -20°C before packing. Since there is no slow freezing during cold storage, it forms a hard and uniform glaze around the product with min. clumping. Uniform thickness of glaze also reduces dehydration. The use of glaze harder reduces drip loss, prevents dehydration and quality deterioration. Investment on machinery can be realised within 3 yr. AA

1380

Gupta (SS) and Chakrabarti (R). **Production of salted and pressed *Decapterus* sp. and its storage characteristics.** *Fishery Technology* 31(2); 1994; 181-184

Optimum curing time, optimum pressure and proper concn. of propionic acid were standardised to prepare salted and pressed *Decapterus* with longer storage life. Dressed fish is immersed in saturated NaCl brine for 7 days followed by pressing in a wooden box under 0.064 kg cm^{-2} pressure for 15 h, packed in 200 guage polythene bags and stored well for one month. Addition of 0.1 and 0.2% propionic acid to the curing brine prevented the growth of red halophiles, moulds and increased the shelf-life of the pressed product to 45 and 60 days respectively. SRA

1381

Prasad (MM) and Panduranga Rao (CC). **Pathogenic vibrios associated with seafoods in and around Kakinada, India.** *Fishery Technology* 31(2); 1994; 185-187

Prevalence of pathogenic vibrios was analysed in 85 fresh, 10 frozen and 4 iced prawn (*Penaeus indicus*), 10 fresh, 20 frozen fish samples collected from local market. 30% of *P. indicus* contained vibrios comprising *V. parahaemolyticus*, *V. vulnificus*, *V. metchnikovii*, *V. cholerae* Non 01, *V. anguillarum* and group *F. vibrios*. Incidence of pathogenic vibrios were lower in fish compared to prawn. SRA

1382

Gildberg (A). **Enzymic processing of marine raw materials.** *Process Biochemistry* 28(1); 1993; 1-15

Processing and modification of marine raw materials (fish, shellfish and algae) by enzymes is reviewed under the following headings: fish sauce and fish silage; protein hydrolysates; ripening by enzyme addition; selective tissue degradation; and miscellaneous methods. It is concluded that present use of enzymes in processing of marine raw materials is limited; herring maturation and fish sauce production are the most important current uses. However, the potential utility of enzymes in the field is considerable. Enzyme use for the production of fish protein hydrolysates is increasing, and selective enzymic hydrolysis as an alternative to mechanical separation may be worthy of development. 130 references. BV

Fish

1383

Ravindranathan Nair (P), Unnikrishnan Nair (TS), Mathen (C) and George Joseph (K). **Thermal treatment for the prevention of insect infestation in dried fish - Use of a**

tunnel drier/solar tent drier. *Fishery Technology* 31(2); 1994; 133-141

Thermal treatment carried out in a tunnel drier/solar tent drier maintained between 55-65°C showed that optimum time of exposure for thin var. of dry fish was 60 min and 90 min for thick fish. Thermally treated products were cooled and packed in polythene bags. Heat treated samples remained insect free for 4 months, refined and preservative treated samples for more than 6 months and untreated samples for only 1-2 months. SRA

1384

Vijayan (PK), Joseph (J) and Gopakumar (K). **Formation of histamine in flying fish (*Hirundichthys coramandelensis*) at ambient temperature and in ice.** *Fishery Technology* 31(2); 1994; 142-147

Sensory qualities, histamine formation in flying fish (*H. coramandelensis*) at ambient temp. (30 plus or minus 2°C) and in ice were studied along with other non-protein components. Initial samples at 0 h did not contain any histamine. In the early stages of storage upto 9 h the histamine production was negligible (3.52 mg/100 g^{-1}), by 13 h reached higher than acceptable level of 55.53 mg/100 g^{-1} and it was rapid on further storage at ambient temp. During iced storage histamine formation was negligible, reaching only 0.22 mg/100 g^{-1} by 17 days of storage. A positive relation was noticed between histamine content and TMAN-TVBN content and sensory qualities. SRA

1385

Antony (KP), Srinivas Gopal (TK), Thankamma (R) and Prabhu (PV). **Effect of packaging materials on the shelf-life of frozen fish fingers.** *Fishery Technology* 31(2); 1994; 148-152

Commercially available lean fish, *Sciaena aneus*, was used for making battered and breaded fish fingers. Fish fingers were packed in flexible film pouches of 50 μ LDPE, 62.5 μ LDPE - HDPE (LD/HDPE), 20 NU High mol. wt. HDPE (HM-HDPE) and 100 μ LDPE - Nylon-Primacore (LDPE/NY/PC), heat sealed and stored at -20°C. Quality evaluation showed that control sample (kept without packaging) were discarded in 4 wk time due to rancidity development, tough texture and colour changes; and samples packed in LD/HDPE and LDPE/NY/PC remained in satisfactory condition up to 28 and 32 wk respectively, whereas LDPE and HM-HDPE packed samples only for 20 wk. AA

1386

Prasad (MM) and Panduranga Rao (CC). **Storage studies on commercial salt cured dry fish with special reference to red discolouration.** *Fishery Technology* 31(2); 1994; 163-166

Quality of 80 samples of commercial salt cured dry fish belonging to 23 sp. groups from Kakinada, S. India, stored in polyethylene bags at ambient temp. (37°C) was monitored up to the point of spoilage. Spoilages were red discolouration (55%), rancidity (38.75%) and fungal contamination (6.25%). Among those showing red discolouration 97.7% of the samples were affected within 2 months of storage, and contained very high levels of total volatile nitrogen and total red halophilic counts. SRA

1387

Davis (L), Goodwin (L), Smith (G) and Hole (M). **Lipid oxidation in salted-dried fish: the effect of temperature and light on the rate of oxidation of a fish oil.** *Journal of the Science of Food and Agriculture* 62 (4); 1993; 355-359

In relation to studies of lipid oxidation during the processing and storage of salted sun-dried fish, the measurement of the initial rate of oxygen uptake was studied on a model system consisting of a highly polyunsaturated fish oil. This parameter was used for assessing effects of temp. and light conditions on the model system and was compared to changes in peroxide value and polyene index. Assessment of oxygen uptake using a Gilson respirometer was found to give a clearer indication than other methods of assessment of effect of different conditions on fish oil oxidation. At 30°C, the initial rate of oxygen uptake increased from 0.103 mul O_2 g^{-1} min^{-1} to 0.158 μl O_2 g^{-1} min^{-1} with a change in light conditions from dark to photosynthesis light. At 40°C, rate of oxygen uptake was faster than at 30°C, and

effect of light was more pronounced, giving values of 0.188 µl O_2 g^{-1} min^{-1} and 0.483 µl O2 g^{-1} min^{-1}, for dark and photosynthesis light respectively. Results for measurement of the initial rate of oxygen uptake suggest its use as a sensitive and reliable method for investigation of the contribution of the many components in salted sun-dried fish towards the rate of oxidation and subsequent rancidity. AA

Bombay duck

1388

Vihn (PQ), Rao (VS), Adhikari (HR) and Nair (PM). **Effect of γ-irradiation on the fatty acid composition of salted, semi-dried Vietnamese scad and Bombay duck.** *Fishery Technology* 31(2); 1994; 154-158

Use of irradiation of 3 kGy to preserve semi-dried Vietnamese scad (SDVS) (*Alepes mate*) and Bombay duck (BD) (*Horpodon nehereus*) does not affect the total lipid content, fatty acid profile in general, except for the reduction in $C_{22:6}$ content of Vietnamese scad and n-3 poly unsaturated fatty acid (PUFA) content. Irradiated SDVS and BD could still form a good source of 2 n-3 PUFA ($C_{20:5}$ and $C_{22:6}$), useful for their therapeutic value in the prevention and treatment of cardiovascular disease. SRA

Crawfish

1389

Dorsa (WJ), Marshall (DL) and Semien (M). **Effect of potassium sorbate and citric acid sprays on growth of *Listeria monocytogenes* on cooked crawfish (*Procambarus clarkii*) tail meat at 4°C.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 480-482

Effects of citric acid (CA, 0.03 g/kg) on the growth of *L. monocytogenes* on crawfish (CF) was not significantly different from that on untreated samples. The lag phase of the bacterium was extended by 2 days when the crawfish was treated with 0.03 g/kg potassium sorbate (PS). Once exponential growth of the bacterium began, a generation time of 28.1 h was observed; this value was not significantly different from that of untreated CF. It is concluded that post processing spray application of 0.03 g/kg of PS or CA to CF has little effect in adding any degree of safety against *L. monocytogenes*. BV

Rockfish

1390

Wiseso-Marseno (D), Hori (K) and Miyazawa (K). **Purification and properties of membrane-bound 5'-nucleotidase from black rockfish (*Sebastes inermis*) muscle.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 863-869

A membrane-bound 5'-nucleotidase from black rockfish, *S. inermis*, white muscle was purified to homogeneity using Triton X-100 for the solubilization and 2 steps of affinity chromatography on ConA and 5'-AMP Sepharose. The enzyme is a glycoprotein, and its active site contains a serine residue. The subunit and native mol. wt. are 67 000 and 265 000, respectively. Optimal pH and temp. using IMP as substrate were 8.3 and 45°C, respectively. The enzyme hydrolysed all nucleoside 5'-monophosphates tested [5'-AMP, 5'-IMP, 5'-GMP, 5'-UMP and 5'CMP] but not other phosphate esters examined [2'(3')-AMP, 2'(3')-GMP, p-nitrophenyl phosphate and sodium beta-glycerophosphate]. The V_{max}/K_m values indicated that, of the substrates tested, the enzyme had greatest affinity for AMP. It was inhibited by phenylmethanesulphonylfluoride, diisopropyl fluorophosphate, ATP, ADP, adenosine, *o*-phenanthroline and EDTA. EDTA inhibition was counteracted by addition of divalent cations. It was inhibited by BHA, at millimolar range, but not by BHT. AA

Products

Fish

1391

Dhanpal (K), Rathnakumar (K), Indra Jasmine (G) and Jeyachandran (P). **Processing chank meat (*Xancus pyrum*) into pickles.** *Fishery Technology* 31(2); 1994; 188-190

Fresh chank (*X. pyrum*) meat collected from Tuticorin, India were cleaned, blanched,

drained, chilled by ice, cut into small pieces and dried. Pickles were prepared by adding 10% ginger, 10% garlic, 0.7% green chilli, 0.25% cumin seed, 0.25% mustard seed, 0.15% asafoetida, 0.1% fenugreek, 0.7% chilli powder, 0.1% curry masala, 10% salt, 40% refined oil, 1% curry leaves, 30% vinegar, 0.5% citric acid, 0.5% sodium benzoate. They were packed in glass bottles, and stored for different storage time (30, 60, 120, 150 and 180 days) at ambient temp. Biochemical, microbiological and sensory analysis showed that the product remained in good condition for 180 days at ambient temp. SRA

1392

Ohshima (T), Nan (LI) and Koizumi (C). **Oxidative decomposition of cholesterol in fish products.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 595-600

Cholesterol oxides (CO) in fish products popular in Japan, including salted-dried, boiled-dried and smoked products, were qualitatively and quantitatively determined as trimethylsilyl ether derivatives by GLC and MS. The level of total CO ranged widely between 8.3 p.p.m. in boiled-dried shrimp and 188.0 p.p.m. in boiled-dried anchovy. 7β-Hydroxycholesterol and 7-ketocholesterol were the most prominent oxidative decomposition products of cholesterol. The levels of epimeric epoxides, cholestane triol and 25-hydroxycholesterol were relatively low. To elucidate a mechanism of cholesterol oxidation during fish processing and subsequent preservation, 4 model systems, consisting of a mixture of purified cod liver triglycerides plus cholesterol, of a mixture of authentic triolein plus cholesterol, of triolein alone and of cholesterol alone, were stored separately at 25°C in dry air for up to 104 days. Residual fatty acids of the triglycerides and the CO produced were recovered and determined. O_2 uptake remained almost unchanged for the mixture of triolein plus cholesterol. No detectable amount of CO was produced and the residual oleic acid content, measured by an internal standard, remained almost unchanged. For the mixture of cod liver triglycerides plus cholesterol, a significant increase in O_2 uptake was observed. A continuous increase in the amount of CO was observed, accompanied by a significant concurrent decrease in polyunsaturated fatty acid residues, as well as of the oleic acid naturally present. Results of the study suggest that cholesterol oxidation in fish products proceeds in conjunction with oxidative decomposition of the coexisting polyunsaturated fatty acids of fish oils. AA

1393

Staby (A) and Mollerup (J). **Solubility of fish oil fatty acid ethyl esters in sub- and supercritical carbon dioxide.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 583-588

Mutual solubilities and K-values of fish oil fatty acid ethyl esters, prepared from sand eel [*Ammodytes lancea*] oil, and sub- and supercritical carbon dioxide were measured in an apparatus originally designed for phase equilibrium, density and gas-oil ratio measurements of reservoir fluids. Measurements were performed at pressures from 2 to 22 MPa at temp. of 283.2, 313.2 and 343.2°K. Experimental temp., pressures, solubilities, K-values and densities are reported. K-values of ethyl myristate, palmitate, oleate, eicosapentaenoate and docosahexaenoate are compared with published experimental binary and/or multicomponent data. Because both vapour and liquid solubilities are reported, such data are applicable in the design of supercritical extraction plants. AA

PROTEIN FOODS

Nil

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Beer

1394

Demuyakor (B) and Ohta (Y). **Characteristics of single and mixed culture fermentation of**

pito beer. *Journal of the Science of Food and Agriculture* 62(4); 1993; 401-408

The fermentation of pito, (a traditional alcoholic beverage from west Africa), was undertaken using selected yeast strains of a crude mixed yeast culture collected from traditional breweries and 2 types of sorghum malt. Fermentation characteristics and product quality of the pure and mixed fermentations were monitored and compared. Significant differences were observed between the mixed culture fermentation and the single culture fermentations. Acid production of the mixed culture fermentations was higher whereas ethanol production and sugar utilization were lower than those of the pure strain fermentations. Sensory observations and analysis of volatile compounds also indicated differences in the fermentations. Use of pure cultures in fermentations proved to yield more ethanol. Sorghum var. was also observed to have an influence on the fermentation pattern. Utilization of nutrients from the white sorghum malt extract was greater and faster than those from the red sorghum. AA

Wines

1395

Herraiz (T) and Ough (CS). **Chemical and technological factors determining tetrahydro-beta-carboline-3-carboxylic acid content in fermented alcoholic beverages.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 959-964

Formation of tetrahydro-β- carboline-3-carboxylic acid in fermented alcoholic beverages were studied in model solutions and during alcoholic fermentation of grape juices. 1S,3S and 1R,3S diastereoisomers of 1-methyl-1,2,3,4- tetrahydro-β- carboline-3-carboxylic acid (MTCA) were formed from tryptophan when acetaldehyde was released by yeast during growth and alcoholic fermentation. Low pH [< 4] and high temp. [80°C] of storage accelerated the reaction between tryptophan and acetaldehyde to give MTCA. SO_2 reacted with both acetaldehyde and tryptophan, restricting the amount of MTCA formed, during alcoholic fermentation and storage. L-Tryptophan and acetaldehyde available for the reactions determined the level of tetrahydro-β-carboline-3-carboxylic acids in wines. Yeast absorbed tryptophan rapidly in the 1st days of fermentation, minimizing formation of tetrahydro-β-carboline-3-COOH. The reaction rate to form 1,2,3,4-tetrahydro-β-carboline-3-COOH (THCA) after reaction of tryptophan with formaldehyde was much faster than for MTCA. THCA may also be formed at the high storage temp. BV

1396

Akinyanju (JA) and Oyedeji (BM). **Comparative study of mixed flora and single strain fermentation in the production of plantain (*Musa paradisiaca*) wine.** *Chemie Mikrobiologie Technologie der Lebensmittel* 15(1/2); 1993; 21-24

Simulation of traditional production of a Nigerian wine from over-ripe plantain indicated that a mixed population of yeasts and bacteria was present in the fermenting must. Amount of alcohol produced by this mixed flora was about 2% after 96 h. The wine had a strong sweetish aroma with a high titratable acidity and was regarded as acceptable by a sensory panel. Fermentation of the over-ripe plantain with individual pure cultures of 3 yeast isolates obtained from the naturally fermenting must, (*Saccharomyces carlsbergensis*, *S. cereulslae* and *Torulopsis* sp.) resulted in wine with higher alcohol content (2.5-4.5%) with the *Saccharomyces* spp. and lower alcohol content (1.5%) with the *Torulopsis* sp. Wine from these single strain fermentations had a different aroma to that obtained from mixed flora fermentation and was not regarded as acceptable in sensory tests. The relationship between changes in pH and titratable acidity differed for the individual fermenting microflora, suggesting different levels of organic acid production. AA

Non-alcoholic beverages

Fruit juices

Cashew apple juices

1397

Kubo (I), Ochi (M), Vieira (PC) and Komatsu (S). **Antitumor agents from the cashew**

(*Anacardium occidentale*) **apple juice.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 1012-1015

Three anacardic acids were isolated as cytotoxic agents against BT-20 breast carcinoma cells from cashew apple juice. In addition to these anacardic acids, cytotoxicity of their 13 congeners isolated from the cashew nut and nut shell oil was examined. Anacardic acids, cardols and methylcardols were found to exhibit moderate cytotoxic activity against both BT-20 breast and HeLa epithelioid cervix carcinoma cells. AA

Grapefruit juices

1398
Low (NH) and Wudrich (GG). **Detection of inexpensive sweetener addition to grapefruit juice by HPLC-PAD.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 902-909

Fingerprint oligosaccharide analysis by HPLC with pulsed amperomeric detection was used to detect adulteration of grapefruit juice. 30 pure grapefruit juice samples were analysed, 15 fresh-pressed/pasteurized juices and 15 concentrates. Individual inexpensive sweeteners (high-fructose corn syrup, beet medium invert sugar and beet invert sugar) were added to pure grapefruit juice samples at 5, 10 and 20%. Each of these materials could be detected (at 5% levels) when added to grapefruit juice. The origin of the oligosaccharides in each of these inexpensive sweeteners was elucidated. The elution programme was shortened to 115 min (total time between sample analysis), which is more conducive to routine sample analysis. AA

Lime juice concentrates

1399
Bhalerao (SD). **A factorial approach to identify reactive constituents and their interactions in multicomponent highly acidic model systems simulating lime juice concentrate (32°C).** *Journal of the Science of Food and Agriculture* 63(1); 1993; 91-94

The non-enzymic browning mechanism in a multicomponent food product such as lime juice concentrate (32°Brix) was investigated using synthetic model systems. A 2-5 factorial experiment was designed and the statistically significant main effects and interactions isolated. 4 interactions (i) citric acid + ascorbic acid, (ii) citric acid + fructose, (iii) fructose + ascorbic acid, and (iv) citric acid + fructose + ascorbic acid and 3 main effects (i) citric acid, (ii) fructose and (iii) ascorbic acid were found to be statistically significant at the 0.05 level. These are interpreted in the light of available literature on non-enzymic browing reactions. AA

Pear juice concentrates

1400
Saenz (C), Sepulveda (E), Araya (E) and Calvo (C). **Colour changes in concentrated juices of prickly pear (*Opuntia ficus indica*) during storage at different temperatures.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 417-421

Tea

1401
Powell (C), Clifford (MN), Opie (SC), Ford (MA), Robertson (A), Gibson (CL). **Tea cream formation: the contribution of black tea phenolic pigments determined by HPLC.** *Journal of the Science of Food and Agriculture* 63(1); 1993; 77-86

Reverse-phase HPLC of liquors prepared from a Lattakari Assam black tea was used to assess the contribution of black tea phenolic pigments to tea cream, a precipitate which forms routinely following caffeine complexation of the phenols when a strong infusion of black tea cools. Caffeine was added back to tea liquor and reconstituted decaffeinated whole tea liquor; the extent to which theaflavins, thearubigins and flavonol glycosides were removed from solution in the form of insoluble complexes was monitored by HPLC. The poorly characterized thearubigins are shown to be the principal (approx. 86%) pigmented phenolic components of tea cream. Theaflavins (approx. 12%) and flavonol glycosides (approx. 2%) were also present. Evidence is presented for a synergistic

interaction between theaflavins and thearubigins during cream formation. Use of caffeine precipitation is proposed as an aid to the fractionation and quantification of phenols including thearubigins in black tea liquors. AA

1402

Owuor (PO) and Odhiambo (HO). **The response of quality and yield of black tea for two *Camellia sinensis* varieties to methods and intervals of harvesting.** *Journal of the Science of Food and Agriculture* 62(4); 1993; 337-343

Effects of black tea var. (sinensis or assamica), plucking (harvesting) round length and method of harvesting on sensory properties and chemical quality parameters were studied. Hand plucked teas contained higher amounts of theaflavins (TF), caffeine and Group II volatile flavour compounds (VFC) and had higher brightness values and flavour index than shear plucked teas; however, they had lower amounts of Group I VFC, irrespective of var. Black teas plucked from short plucking rounds were superior to those from long plucking rounds with respect to TF, caffeine, brightness, chemical aroma quality parameters and sensory analysis. Long plucking intervals and shear plucking reduced tea yields and produced coarser leaves than short plucking intervals and hand plucking. BV

FATS AND OILS

1403

Hunter (JE) and Applewhite (TH). **Correction of dietary fat availability estimates for wastage of food service deep-frying fats.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 613-617

1404

Ang (JF). **Reduction of fat in fried batter coatings with powdered cellulose.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 619-622

Fat contents of fried batter coatings were reduced significantly (7-28%) when 1% powdered cellulose (fibre length in excess of 100 μm) was incorporated into the batter. In addition, moisture and DM contents were increased significantly in these coatings. Although fat reductions were observed in both shortening and oil, cellulose had a greater effect in shortening. The decrease in fat and increase in moisture could be due to hydrogen bonds forming between water molecules and cellulose fibres. Results from water and oil retention capacities indicate that powdered cellulose is more hydrophilic than lipophilic. This could also restrict the displacement of water by fat during frying. AA

1405

O'Donnell (C) and Best (D). **Fats fight back.** *Prepared Foods* 162(2); 1993; 41-42

Discusses US regulations on nutritional labelling and health claims of total fat, saturated fat, trans-fatty acids, cholesterol and omega-3 or omega-6 fatty acids in food products. Other aspects considered include: commercial introduction of structured lipids (caprenin); triglyceride rearrangement and transesterification; and creation of unique fats with unique properties. BV

Cocoa butter

1406

Goh (SH), Yeong (SK) and Wang (CW). **Transesterification of cocoa butter by fungal lipases: effect of solvent on 1,3-specificity.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 567-570

Effects of solvents (hexane and diethyl ether) on 1,3-specificity of transesterification of cocoa butter, catalysed by immobilized lipases of *Mucor miehei* and *Humicola lanuginosa* were studied using GC and NMR spectroscopy. Results indicated that using hexane as solvent, *M. miehei* and *H. lanuginosa* lipases were not 1,3-specific. Large amounts of oleic acid were liberated, indicating reaction of fatty acids from position 2. When diethyl ether was used as solvent, both lipases clearly demonstrated 1,3-specificity. BV

1407
Gilkison (IS) and Shone (GG). **The rearrangement of fatty cyclopropenoids in the presence of boron trifluoride.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 607-612

Cottonseed and kapok oils contain the cyclopropenoid fatty acids 9,10- methyl eneocta dec-9- enoic (sterculic) and 8,9-methylene- heptadec-8-enoic (malvalic) acids in glycerides; these compounds may have adverse physiological effects which must be destroyed. Destruction of the cyclopropenoid ring system of methyl 9,10-methyleneoctadec-9-enoate (methyl sterculate) with boron trifluoride etherate was shown to give a complex mixture of products, including methyl esters of C_{19} allenes (12%), a C_{18} alkyne (11%) and a variety of C_{19} and C_{20} conjugated dienes containing either a methyl or methylene branch. The methylene group lost from the methyl sterculate reactant in the formation of methyl octadec-9-ynoate was incorporated into a second molecule of reactant to yield a mixture of methyl 9-methylene-trans-nonadec-10-enoate and the 11-methylene-trans-9-isomer. The use of boron trifluoride eliminated the possibility of formation of irreversibly adsorbed products. BV

Avocado oils

1408
Lozano (YF), Mayer (CD), Bannon (C) and Gaydou (EM). **Unsaponifiable matter, total sterol and tocopherol contents of avocado oil varieties.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 561-565

Sterols and tocopherols contents of 4 avocado oil from avocado var. (Zutano, Bacon, Fuerte and Lula) were determined by HPLC. Both ripe and unripened fruits were studied. Sterol contents in oil were higher in unripened (1.1-6.2%) than in ripened (0.8-2.0%) avocados. Tocopherols contents varied between var. and tocopherols in oil were higher in unripened (20.1-45.6%) than in ripe fruit (5.7-10.3%). BV

Castor oils

1409
Kula (J) and Sadowska (H). **One-pot synthesis of (*E*)-2-nonenal from castor oil.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 643-644

A one-step procedure for preparation of (E)-2-nonenal [for using as a flavouring] from commercial castor oil by ozonolysis in acetic acid, followed by exposure of the resulting intermediate product to *p*-toluene sulphonic acid, is described. The manufactured aldehyde is of high purity (99%) and the method is simple and uses inexpensive raw material. The aldehyde can be added to naturally or synthetically flavoured food stuffs (meat, coffee, and other beverages). BV

Coconut oils

1410
Lih (L-W), Bao (K-Y), Parkin (KL) and Johnson (EA). **Inhibition of *Listeria monocytogenes* by monoacylglycerols synthesized from coconut oil and milkfat by lipase-catalyzed glycerolysis.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 1000-1005

Monoacylglycerols (MAG) synthesized from coconut oil and milk fat were evaluated in brain heart infusion (BHI) broth and in pasteurized milk for antimicrobial activity against the Scott A strain of *L. monocytogenes*. MAG were produced by solid-phase glycerolysis catalysed by lipase PS-30 from *Pseudomonas* sp. and purified by hexane fractionation. Purities of MAG from coconut oil and milk fat before hexane fractionation were 74.6 and 54.5% and after fractionation were 97.5 and 95.7%, respectively. Fractionated coconut MAG had slightly more inhibitory activity towards *L. monocytogenes* than unfractionated MAG. *L. monocytogenes* was inactivated by hexane-fractionated coconut MAG at 250-400 µg/ml in pasteurized skim milk, at 500-750 µg/ml in 2% milk and at 750-1000 µg/ml in whole milk at 4°C, but the MAG were less inhibitory at 13°C and at room temp. MAG prepared from coconut oil were more effective than monolaurin against *L. monocytogenes* in

BHI and pasteurized milk, whereas MAG made from milk fat did not inhibit *L. monocytogenes* in pasteurized milk. The composition of fatty acids present in the coconut MAG was associated with the anti-listerial activity, lauric acid (C_{12}) being the most active fatty acid of the series C_8-C_{14}. Certain combinations of the MAG, particularly monocaprin and monolaurin, showed synergistic activity against *L. monocytogenes*. Results indicate that MAG synthesized from coconut oil could be used to control *L. monocytogenes* in certain dairy products or in other foods that contain reduced fat. AA

Groundnut oils

1411

Singleton (JA). **Enrichment of phospholipids from neutral lipids in peanut oil by high-performance liquid chromatography.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 637-638

Phospholipids from crude peanut oil were enriched on a 2-cm silica column and subsequently separated from neutral lipids by HPLC without prior concn. Hexane effectively removed bulk neutral lipids, leaving adsorbed phospholipids on the silica precolumn. Individual phospholipids were separated from the remaining neutral lipids and from each other using 2 mixed solvents and a gradient programme. This method separates the phospholipids in approx. 27 min after the desired enrichment level has been reached. AA

Onosmodium hispidissimum

1412

MacKenzie (SL), Giblin (EM) and Mazza (G). **Stereospecific analysis of *Onosmodium hispidissimum* Mack. seed oil triglycerides.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 629-631

The fatty acid composition of *Onosmodium hispidissimum* Mack. seed oil [rich in γ-linolenic (LA) and stearidonic acids (SA)] and the stereospecific distribution of γ-LA and SA in the seed oil triglycerides were determined. The seed oil contained approx. 20% γ-LA and 8% stearidonic acid. Approx. 90% of both γ-LA and SA were esterified to the *sn*-2 and *sn*-3 positions. BV

Sesame oils

1413

Vazquez (TJF) and Uribe (RA). **Adsorption isotherms of sesame oil in a concentrated miscella system.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 589-594

Adsorption of peroxides, unsaturated carbonyls, free fatty acids and carotenoids from unrefined sesame oil on vegetable carbon (5%, w/w) in a miscella system was studied. 3 different solvent conditions (hexane/ethanol, 100:0, 95:5 and 75:25, vol./vol.), combined in a factorial design with 5 levels of solvent (0, 10, 20, 30 and 40% w/w), were used to develop the miscella. Equilibrium adsorption was not achieved during the 100 min of adsorption, mainly because oil components were involved in oxidation reactions during the adsorption process. However, for a given solvent concn., adsorption of oil components showed a significant linear regression on their respective initial concn. in the miscella (C_i). Peroxides and carbonyls showed, at all solvent levels investigated, an affinity for the carbon more independent of their C_i than free fatty acids and carotenoids. In general, at the same C_i, a higher adsorption was achieved as solvent concn. increased. Results indicated that free fatty acids absorption may depend on competitive adsorption based on molecule hydrophobicity. However, in spite of the higher hydrophobicity of carotenoids, compared with free fatty acids, they might not be competing for the same adsorbing sites. Ethanol showed a prooxidant effect that increased peroxide production during adsorption but did not affect the reaction involved in carbonyl production. AA

Soybean oils

1414

Mingyu (J) and Proctor (A). **The effect of added solvents on soy oil lutein adsorption by silicic acid.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 575-578

Soy oil miscellas were prepared by diluting soy oil with hexane. Solvents used included: water;

methanol; ethanol; n-propanol; isopropanol; n-butanol; isobutanol; 2-octanol; 1-nonanol; and 1-decanol. Propanal, acetone, 2-butanone, acetic, propionic, n-butyric, isobutyric and octanoic acids, and methyl and ethyl acetates were also used. Lutein adsorption followed a Freundlich isotherm and added solvent reduced lutein adsorption to silicic acid. Alcohols were the most effective solvents for inhibiting lutein adsorption. Propionic acid was the most effective non-alcohol solvent, but most non-alcohol solvents were ineffective. Results indicated that alcohols may compete more effectively with lutein for adsorption sites due to their ability to form hydrogen bonds with silanol groups. BV

1415

List (GR) and Mounts (TL). **Origin of the nonhydratable soybean phosphatides: whole beans or extraction?.** *Journal of the American Oil Chemists' Society* 70(6); 1993; 639-641

Whole soybeans and flakes, tempered to normal (10%) and elevated (14%) moisture levels, were stored and then extracted under a variety of conditions in the presence or absence of phospholipase activity. Crude oils were degummed and the resulting nonhydratable phosphatide (NHP) content was determined. Extractions performed on flakes at ambient temp. or at the b.p. of hexane showed that at normal (10%) moisture levels extraction temp. had little effect on the magnitude of NHP formation; whereas at 14% moisture, considerably higher levels of NHP were observed at the higher extraction temp. Studies performed with 10 and 14% moisture whole beans stored at 40°C for extended periods, with or without inactivation of enzymes, showed that at normal 10% moisture levels little deterioration occurred after 1 wk of storage; however, after 4 wk considerable NHP is formed. At 14% moisture, NHP formation was rapid during the first wk of storage, and complete destruction of phospholipid occurred after 4 wk storage at 40°C. Results indicate that the adverse effects of storage conditions, excessive moisture levels and elevated temp. cannot be overcome by inactivation of phospholipase D prior to solvent extraction of soy flakes. AA

Sunflower oils

1416

Kaya (A), Tekin (AR) and Oener (MD). **Oxidative stability of sunflower and olive oils: comparison between a modified active oxygen method and long term storage.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 464-468

Shelf-lives of sunflower (SO) and olive oils (OO) subjected to long term storage were determined; results were compared to those from an accelerated shelf life testing method. Effects of container properties (packaging material, O_2 permeability and transparency) on shelf-lives were also studied. Peroxide values were measured to determine oxidative stability. Oil samples in PET bottles, clear glass bottles and coloured bottles were aged at 10 and 20 plus/minus 0.2°C under a fluorescent lamp. Analysis was in terms of milli-equivalents of peroxides per 1000 g of sample. Under retail storage conditions, shelf-lives of the SO and OO were 10.6 and 20.8 months, respectively. Shelf-life of SO in the PET, clear glass and coloured glass bottles was 10.4, 11.1 and 11.8 months at 10°C, and 4.8, 5.1 and 6.5 months at 20°C, respectively; at 10°C, shelf-life of OO was 17.5, 17.8 and 18.3 months and 8.0, 8.4 and 8.7 months at 20°C, respectively. BV

SPICES AND CONDIMENTS

Spices

Basil

1417

Rocha (T), Lebert (A) and Marty (A-C). **Effect of pretreatments and drying conditions on drying rate and colour retention of basil (*Ocimum basilicum*).** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 456-463

SENSORY EVALUATION

1418

Lytle (PC). **Innovations in flavour development: A case study.** *Food Technology* 48(2); 1994; 94-97

This case study tracks the impact of sensogen's flavour development work on a new product for one of the world's largest companies. It demonstrates the advantages created through strategic partnerships where technology is shared. CSA

1419

Kimmel (SA), Sigman-Grant (M) and Guinard (J-X). **Sensory testing with young children.** *Food Technology* 48(3); 1994; 92-94, 96-99

The purpose of the study was to develop and evaluate reference methodology for sensory testing with young children. Specific objectives were: (1) to determine which sensory tests can be used; (2) the age at which children develop the cognitive ability required to understand sensory tests; and (3) the effect, if any, of the testing environment on a childs response. The implications drawn were thaf children can be a valuable measuring tool for sensory testing if appropriate testing environment and protocol are used. CSA

FOOD STORAGE

1420

Leistner (L). **Food preservation by combined methods.** *Beverage and Food World* 21(3); 1994; 8-10

Water activity and food preservation, Hurdle effect and food stability, Hurdle technology and food design, shelf stable products storable without refrigeration, novel and traditional intermediate moisture foods based on meat are the aspects described in this article. SRA

INFESTATION CONTROL AND PESTICIDES

1421

Auld (GW), Kendall (PA) and Chipman (H). **Consumer and producer perceptions and concerns regarding pesticide use.** *Food Technology* 48(3); 1994; 100, 102, 107-109

Focus groups were conducted among consumers and producers to understand the perspectives and concerns about agricultural chemicals. The profile, responses (food preferences and concerns, pesticide safety concerns, pesticide control, organic option) and perceptions of the focus groups are dealt. The results show that the focus group participants believed that pesticide use was driven by consumer demand. CSA

1422

Rangaswamy (JR) and Gunasekaran (N). **Free phosphine in the void space of food commodities during phosphine fumigation.** *Lebensmittel Wissenschaft und Technologie* 26(5); 1993; 447-449

On fumigation with 6 phosfume tablets/t, cereals and milled wheat products showed greater amounts of free phosphine in their void space than gram, dhal and paddy. Paddy retained the least amount at 40 µg/mg. Raw rice retained a greater amount of free phosphine than paddy; dhals retained less than the corresponding grams before milling. Arabica coffee beans retained less free phosphine than Robusta beans. It is concluded that it is not advisable to offer the same dose for all commodities, as the free phosphine content in the void space is different for different commodities. BV

1423

Halstead (DGH). **Keys for the identification of beetles associated with stored products. II. Laemophloeidae, Passandridae and Silvanidae.** *Journal of Stored Products Research* 29(2); 1993; 99-197

Key features for the identification of the beetle families Laemophloeidae, Passandridae and Silvanidae found in stored products throughout the world are provided. Pest spp. which are regularly brought into the store with the crop, and spp. which are found in stored products mainly because of their association with dunnage or structural timbers are included. 47 spp. and 18 genera are described. Notes on distribution and biology including several new storage and field distribution records are also provided. BV

1424

Rostom (ZMF). **Survey of some granivorous and non-granivorous insects and mites of stores in Saudi Arabia.** *Journal of Stored Products Research* 29(1); 1993; 27-31

Insects and mites infesting wheat, maize, wheat bran and dust samples, stored in or collected from Riyadh and Dammam Provinces, Saudi Arabia, during 1987 and 1988, were identified. Of these pests, 16 spp. of insects were mainly granivorous. Another 26 insects spp. and 7 mite spp. were mainly non-granivorous, being either predators, parasites, scavengers or incidentals. The relative abundance of the different species is discussed, and found to be dependent on season, province and type of commodity. Species found in both season and provinces, including 9 granivorous (4 *Trogoderma* spp., *Tribolium castaneum*, *Latheticus oryzae*, *Rhyzopertha dominica*, *Liposcelis* sp. and one *Thysanoptera* sp. beside *Coleoptera* larvae) and 2 non-granivorous (1 *Cecidomyiidae* sp. and *Acaropsis sollers*) spp. AA

BIOCHEMISTRY AND NUTRITION

1425

Best (D). **Piecing together the nutrition puzzle.** *Prepared Foods* 162(3); 1993; 44, 46, 48, 50-51

The effects of changing knowledge of nutrition on nutritional regulations for foods are described. Aspects covered include: nutritional variability and diversity between individuals; implications for nutritional labelling; personalized nutrition; macro-nutritional needs applicable to the general population; nutritional advice for heart disease; and implications for food regulations and health claims. BV

TOXICOLOGY

1426

Pitt (RE). **A descriptive model of mold growth and aflatoxin formation as affected by environmental conditions.** *Journal of Food Protection* 56(2); 1993; 139-146

A model which integrates literature data on the effects of temp., a_w, pH and colony size on mould growth and aflatoxin formation is presented. Mathematical forms for the rates of growth and toxin formation are based on assumptions about the biology of toxigenesis. An Arrhenius-like function is postulated for effects of temp.; shape parameters in the function are selected assuming that optimum temp. bears a fixed relationship to temp. limits for growth and toxigenesis, which vary with a_w. A linear function is postulated for effect of a_w with the lower limit dependent on temp. Parabolic and Monod models are used to describe effects of pH and colony size, respectively. Toxigenic parameters are estimated by comparing model simulations to results of 2 published studies, with fair consistency in the 2 sets of parameters. The model did not correctly projectthe effects of spore load, but did correctly predict toxigenic behaviours relating to effects of temp. and temp. cycling. The model provides a theoretical explanation for observed temporal shifts in the optimum temp. for toxigenesis, and for a hyperbolic relationship between heat units and time to toxigenesis with and without temp. cycling. CSA

FOOD LAWS AND REGULATIONS

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